Gas Journal

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Editorial Notes

The Joint Committee

Our readers will not have missed the announcement last week that the Government propose to take immediate steps to appoint a Joint Committee of both Houses of Parliament to enquire into the charges of the South Metropolitan Gas Company. The personnel of the Joint Committee has not yet been announced, but it is understood that it will consist of seven peers, seven members of the House of Commons, with one additional member to act as Chairman.

It is clear that the terms of reference will be sufficiently wide to enable the Committee to extend the enquiry beyond the scope of the South Metropolitan question; it is probable that it will embrace gas companies authorized to operate under a basic price and basic dividend system. It will doubtless be the duty of the Committee to consider whether adequate protection is afforded to the interests of the different classes of gas consumer under such powers, and it will be authorized to report to the Government what action, if any, may be necessary. The Committee will no doubt sit in public, and the parties will be represented by Counsel.

It will, of course, be for the Committee to state what evidence they desire to hear, but it may be assumed that the South Metropolitan Gas Company and the National Gas Council will be requested to give evidence. It would not be proper for us to comment at this stage upon a matter which is to be considered by a Parliamentary Committee; but the matter is one which vitally affects the Industry; and we shall naturally follow the proceedings with the closest interest.

We would commend to the notice of our readers a recent leader in *The Times* which, in the clear and able manner characteristic of our leading daily, called attention to the disparity which existed between the powers of the electricity industry and those of Gas. There will be general agreement that two industries which are in keen competition throughout the country should be fairly and impartially treated by the Government.

"Sulphur Must Go"

It is to be hoped that the Report on the removal of sulphur compounds from town gas, presented at the Research Meeting of The Institution of Gas Engineers, will result in some definite action being taken without delay to achieve throughout the Gas Industry the elimination of sulphur, which will enable consumers to burn gas fluelessly without the most sensitive person being conscious of the presence of sulphur products in the atmosphere. It cannot be disputed that, although the amount of sulphur products in the atmosphere in rooms in which gas is being burned fluelessly is extremely small and quite harmless to health, their mere presence is against the best interests of the Gas Industry. The title of the Report is "The Removal of Sulphur Compounds from Town Gas down to 10 gr. per 100 cu.ft." A modification of the normal oil washing process for benzole extraction has been developed by the Gas Light and Coke Company whereby the sulphur content should be economically reducible to less than this amount. Virtually complete removal of sulphur compounds should be attainable by combining in series the oil washing or active carbon process with the catalytic process, or by operating the active carbon process with a reduced adsorption period, but in either case increased operating costs would be involved.

The Report concludes: "An all-round reduction of the sulphur compounds of town gas to 10 gr. per 100 cu.ft. would represent an immediate advance which is possible and strongly to be recommended." Dr. Harold Hartley, the originator of the "Sulphur must go" slogan, does not regard this reduction as enough. What we need is a sulphur-free gas. To-day salesmen are compelled by force of circumstances to advocate the use of flueless appliances; and the scope for gas heating would be very much widened if gas could be burned fluelessly without the objectionable feature of producing sulphur dioxide and sulphur trioxide. The point we would emphasize is that sulphur, from a practical and economic point of view, can to a large extent be removed; and it should be removed. As Mr. C. A.

Masterman said at the meeting, the purpose ultimately of making gas is to sell gas, and if the product that we try to sell is not up to modern searching requirements, our future will be limited. Development in the next few years will add substantially to the amount of gas used in the home, and many of these developments will require the use of gas fluelessly. Then there is the purely economic aspect of the presence of sulphur in so far as it affects maintenance and replacement of appliances and the general disturbance of the consumer in his home.

The industrial load, too, must be considered. The work of the Gas Research Fellow reported at the meeting illustrates the remarkable attack of sulphur dioxide on some special alloy steels. It penetrates the metal with harmful results, and the change in structure of the metal may prove to be as important as the effect of scaling. The rate and amount of scale formation is not the only determining factor in the preference for gas low in sulphur. Mr. Bloor explained how a reduction in sulphur compounds in the gas at York had eliminated the trouble of the formation of a bloom on the finished product when a gas with a high sulphur content was used for glass melting; while Mr. Mackay, of Stoke-on-Trent, mentioned that a low-sulphur gas has made possible direct firing of pottery ware, eliminating the heat wastage due to the employment of muffle ovens, saggars, or other protective materials.

Coronation Roads

In his Presidential Address to the British Road Tar Association, which was published in the "JOURNAL" last week, Sir David Milne-Watson referred to the intention of the Government to transfer 4,500 miles of main trunk roads from county councils to the direct control of the Ministry of Transport—a decision which probably foreshadows the day, perhaps not very far distant, when a central authority will assume responsibility for the control and maintenance of the entire road system of the country. At the time of the announcement of the decision in July last we said that the Gas Industry must vindicate its claims to produce and apply the safest, most durable, and most economic form of material, in tar, for first-class road making. The tar-macadam road of to-day possesses unique properties of durability; such a road provides perfect non-skid and riding qualities over a longer period than formerly, without need for renovation. The coming developments under the system of national control should result in a much wider use of tar, and the new scheme demands a strong central tar association. Every effort should be made to ensure 100% support of the British Road Tar Association by all producers and distillers.

Attention was called by Sir David to the value of the research work of the Association in collaboration with other bodies. One of the notable features of the past year has been the approval of the Association's Trade Mark "Brotox" for non-toxic tar. This culmination of much research and experimental work should lead to a demand for tar to be used on roads draining into fishing streams. A satisfactory feature of the experimental road laid with this particular tar was its non-skid property. And in regard to this development, Sir David mentions the help given to the Association by the Ministry of Agriculture and Fisheries and the Government Chemist's Department in bringing the investigation to a satisfactory conclusion. Other research during the year has been progressive both in collaboration with the Department of Scientific and Industrial Research and by the Association's Research Committee. The Road Research Board, in conjunction with the Ministry of Transport, is now conducting practical road experiments with tar based on data obtained from the investigations undertaken on road-testing machines and in the laboratories of the Board. Also arising from the research work, large-scale surface-dressing experiments are being carried out under the jurisdiction of the Joint Road Tar Research Committee.

We have emphasized the durability of the tar-macadam road when properly laid. Last year terminated a five-year guarantee given by the British Road Tar Association for two sections of tarmacadam laid on the Kingston By-Pass in 1930. Since that date only very minor repairs have been necessary, and the satisfactory non-skid and durable qualities of these sections are evidenced by the fact that the Experimental Work on Highways (Technical) Committee of the Ministry of Transport decided that the sections required no immediate treatment. No one can expect a more satisfactory result from any type of road than this—six years subject to increasingly heavy traffic. Tar has proved itself a most efficient road material. It is a material wholly British, and its claims are sufficient for the Ministry of Transport to give favourable consideration to the wider application of tar. Sir David, in his Address, suggested that immediate plans should be made for the construction of a series of Coronation roads that would mark the beginning of a new era in the history of highway engineering. Our roads represent "perhaps the most important part of our domestic economy." This quotation is from J. L. McAdam, the centenary year of whose death was marked by the choice of Scotland as the venue for the first time of the International Road Tar Conference. At that Conference tribute from other countries was paid to the excellent quality of British roads made with tar. The British Road Tar Association has done much to build up this reputation, and its activities should do much to influence the decision of the Ministry of Transport, when consideration is being given to the materials to be used for the Coronation roads, to employ a British product—a product of the Gas Industry.

Alkalis and Refractories

In our issue last week we published an article by Mr. H. T. S. Swallow, of the Research Department of Imperial Chemical Industries, Ltd., on the effect of alkalis on refractory materials. The article is of significance in view of the process which has been proposed for the production of coke which would ignite and burn readily in an ordinary grate by being activated by the addition of sodium carbonate and lime to the coal prior to ordinary high-temperature carbonization. A large proportion of the plant used for the production of coke represents money spent on refractory materials, and the selection, care, and maintenance of refractories play an important part in keeping down production costs. Coke producers, anxious to experiment with sodium carbonate activation on a full-scale plant, have been deterred by the possibility of the deterioration of the refractories of retorts or coke ovens. Trials are actually in progress on both small-scale and large-scale plant, but the results so far available are not sufficient to enable a reliable estimate to be made of the effect on the cost of refractories of additions of lime and

sodium carbonate to the coal. But, says Mr. Swallow, "it is possible to conclude at the present stage that the increase in the cost of refractory repairs is likely to be small."

The Author gives the results of an experimental run of a producer—one of two identical producers coupled to the same flue—the duration of the run being 6½ months. In this period 0·5% of sodium carbonate and 2% of hydrated lime, calculated on the weight of coal, were fed into the producer. So that the effect of the sodium carbonate on the refractories might be observed, panels of new firebrick were built into one wall of each of the two producers before the run. The effect of the sodium carbonate on the working of the one producer was very marked. The producer was hotter throughout the run, required very little poking, and worked more freely than the other producer. The condition of the activated producer after the run was notable for its complete freedom from deposits of soot and clinker. In particular the producer ran hotter at the top. The rate of wear of the firebricks was greater in the activated producer. This, however, suggests Mr. Swallow, might be regarded as a secondary effect, being due more directly to the higher temperature and more fluid slag resulting from the activated fuel than from alkali attack. Except where they had been corroded by slag, the dimensions of the firebricks were perfectly normal. They contained no cracks other than those attributable to temperature stresses or such as usually occur in firebrick work.

There are indications, the Author concludes, that the explanations offered by Professor Cobb in 1916 on the chattering of coke oven walls "must now be regarded as containing at the most only an element of truth." Professor Cobb suggested that the destruction of refractories by sodium chloride is due to the vaporization of this salt and penetration into the pores of the refractory, and that a sodium aluminium silicate is then formed which, on melting, causes the failure of the refractory. It seems probable, Mr. Swallow maintains, that the presence of the acid radicle, either chloride of sulphate, is essential if this type of destruction is to occur, and that the honeycomb appearance noted by Professor Cobb in the walls of a failing coke oven is not directly connected with the cause of the disintegration of the walls from within. Sodium carbonate, however, does not give rise to acid vapours, and chattering from this cause is impossible.

Mr. Swallow goes on to observe that there appear to be no examples of rapid failure of refractories in coke ovens and gas retorts in which it was proved that the damage was caused by the sodium radicle which had penetrated in the vapour phase. The small amounts of sodium which have from time to time been reported in the analyses of firebricks taken out of various types of plant could in almost all cases have reached the situations in which they were found by diffusion of solid, or more probably by absorption of low melting mixtures of alkali salts. "There is no need to stress the remoteness of the possibility of serious attack by alkali salt vapours, as even when this suggestion has been made it has always been in the nature of a speculation. It is therefore concluded that if any damage to gas retort settings results from the addition of alkalis it is to be looked for on the insides of the retorts. It has been shown that there is little fear of damage to producer linings due to the use of sodium carbonate and lime or of activated coke. There is, however, no reason to suppose that the action of the alkali would even be more than one of the minor causes of the ultimate failure of the refractories or that it would result in noticeable increases in working costs."

The Electricity Industry

THE Sixteenth Annual Report of the Electricity Commissioners for the year ended March 31 records another substantial expansion in sales, the increase over the previous year being 2,525 million units, or a matter of 16%. That the full severity of competition has yet to be felt is indicated by particulars for the year ended Dec. 31, 1934, obtained from authorized undertakers. These particulars disclose that the areas of supply of the 625 undertakings contained about 12,535,000 premises, of which only 53% were connected to the public supply systems. Of the total premises, about 10,636,000, or nearly 85%, were domestic premises, and 52% of these were connected to the supply systems. The report states that while the survey reflects the substantial progress which has been made in the development of the public supply of electricity throughout Great Britain, it also discloses the potentialities before the electricity industry—5,855,000 unconnected premises, apart from the possibilities of securing an extended consumption of electricity for existing and additional purposes in the premises already connected to the supply systems. These figures give a glimpse of the nature of the competition which the Gas Industry will have to face.

The report points to the scope which exists for the provision by electricity undertakings of such "necessary adjuncts to commercial development" as showrooms, canvassing, assisted wiring schemes, and two-part tariffs for domestic supplies. "As a consequence of the general availability of bulk supplies directly or indirectly from the grid system on more uniform terms than hitherto, the conditions have become increasingly favourable for the adoption by authorized undertakers of more uniform methods of charge for supplies to consumers, and in particular for the offer of a two-part domestic tariff with low unit charge." The figures relating to electricity charges are interesting and, we suggest, a pointer to the Gas Industry. Two-part tariffs for domestic purposes were being offered at the end of 1934 by 506 undertakings, or 81%; and it is nearly two years since the time to which the figures of the survey relate. We should like to know what percentage of gas undertakings has adopted two-part tariffs as a counter to the policy of the electricity industry. As we have mentioned, the Report of the Electricity Commissioners recommends greater uniformity in the methods of charge; but it is stated that, in regard to the fixed charge, 217 undertakings had adopted as basis the rateable value of the premises supplied, while 161 undertakings had adopted the size of premises—floor area or number of rooms—as basis. The electricity industry is out for those 5 million odd homes. Its measure of success will depend on the service given by the Gas Industry; it will be in inverse ratio to the quality of gas service.

A Needed Warning

CONCERN has lately been expressed in various quarters at the financial losses sustained by certain classes of the community through (shall we say?) injudicious handling of their modest monetary resources. That the victims are generally those people who are least able to bear such losses provides the saddest aspect of these occurrences, but at the same time it is a natural feature of them, inasmuch as it is the slenderest purse which stands most in need of replenishment. Thus it is reasonable to

expect the temptation to venture upon the treacherous paths of speculative investment will be greatest in the case of those who should be the very last to tread them.

Periods of stock market activity like the present, when steadily increasing national prosperity has put sound financial undertakings and propositions well on the upgrade, furnish golden opportunities to those who "spread their nets for the unwary," and the "bucket-shopkeeper" and "share-pusher" are busily engaged in taking the fullest possible advantage of the favourable conditions. Most people will have heard or read of cases in which unfortunate persons possessing an abundance of credulity altogether out of proportion to the smallness of their business ability or experience have sustained grievous losses—and only too often deprivation of their entire resources—through being persuaded to an unwise "deal." There have been announcements, also, of firms having "closed down," with colossal liabilities, and the principals displaying no anxiety to come forward and explain how it is that the money has "disappeared."

The position is deplorable, and an unfortunate thing about it is that, inevitably, many who conduct their business in an honest and straightforward manner will come under suspicion through the wrongdoing of others. That would be another reason—were another reason required—why energetic action against the evil should be taken. There are those who altogether fail to understand how it comes about that the Government permit such abuses as the ones to which we have been referring to continue without the enactment of further legislation aimed at their prevention; for it is difficult to fall in with the view that means could not be devised of putting some further curb upon the more flagrant offenders. That will come in time, no doubt; but while waiting for such tightening-up of the law what can be done in the way of putting unsuspecting persons on their guard should be done. However, there is hope at last that something really effective may be accomplished in course of time; for the President of the Board of Trade has announced his intention to set up as soon as possible a Departmental Committee "to consider the operations of fraudulent vendors of shares, and to make recommendations as to the action to be taken." After making this statement, Mr. Runciman was asked in the House of Commons whether he could not take steps through the Press to warn people against buying worthless shares.

Gas Undertakings Can Help

When dealing with the subject of thrift in the "Journal" a fortnight ago, we remarked that a large proportion of gas investors in all probability would come within any reasonable definition of "small investors" (including, of course, the large numbers of co-partners), and embraced within this qualification are just the sort of people who normally would be most susceptible to the wiles of the share tout. So the gas companies may fairly be expected to take a hand in warning against their danger these little capitalists, who are really the backbone of the country. It could be done by means of a prominent announcement, or even a red ink insertion, in the periodical magazines which are now issued by quite a number of the more important gas companies and municipally-owned undertakings. Such an announcement, circulated in this way, would come to the notice of a large number of small property owners, and if no more than one of them was saved from ruin would not the effort have been well worth while? Then, of course, there are the annual reports which will be issued to the general body of shareholders in about two months' time. These will afford further suitable opportunity for the dissemination of the needed warning.

There is no room for doubt as to the form which the warning might best take; for some of the big Banks have furnished examples in slips which they have arranged to have inserted in the pass-books of customers. That of the Westminster Bank, Limited, may be cited:

> "CONSIDERABLE LOSSES are sustained from time to time by members of the public owing to the activities of fraudulent share vendors, whose usual procedure is to offer through the medium of the post investment opportunities which appear to be exceptionally profitable.
>
> "Before entering into such transactions with parties of whom nothing is known, customers are urged to consult their Branch Manager who will be pleased to make enquiries regarding the standing and *bona fides* of such parties.
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> "This simple precaution may not only save the customer a good deal of worry and anxiety, but may be the means of avoiding serious financial loss."

Something on these lines would put the small holder of gas stock beyond risk of loss, if he were advised before entering into transactions to take counsel in some competent quarter. We do not, of course, suggest that gas undertakings themselves should offer to give advice as to investments. The warning should be merely in general terms.

But its need, in one form or another, we would once again stress, and in case our own appeal is not sufficient, here is what a correspondent of the *Financial Times* lately had to say upon the subject: "During the past five years approximately £5,000,000 has been procured by bucket-shopkeepers from the small man, widow, spinster, and non-business legatee, who have parted with savings in order to become richer upon promises received from the share-pusher fraternity. . . . In this country no adequate legislation exists to counteract the evil effects of the bucketeer." Let this be an additional way in which the operations of the great Gas Industry tend to the well-being of the community.

Forthcoming Engagements

Nov.

19.—Midland Association.—Autumn General Meeting at Birmingham.
20.—London and Southern Juniors.—Meeting and Paper by W. L. Boon.
21.—Yorkshire Juniors.—Meeting at Leeds; Presidential Address of E. R. B. French.
21.—Western Juniors.—Visit to Norton Hill Colliery.
21.—Midland Juniors.—Visit to Austin Motor Works.
21.—Scottish Eastern Juniors.—Visit to Inverkeithing.
24.—Wales and Monmouthshire Juniors.—Visit to Cardiff Engineering Exhibition.
26.—I.G.E.—Advisory Committee on Research at 2.30 p.m.
27.—Southern Association.—General Meeting at the May Fair Hotel, W. 1, at 2.30 p.m.
27.—I.G.E.—Liquor Effluents and Ammonia Committee at 11.15 a.m.; Joint Research Committee at 2.30 p.m.
28.—North of England G.M.A. (Auxiliary Section).—Meeting at Newcastle-upon-Tyne and Paper by J. F. Lord.
28.—Wales and Monmouthshire Juniors.—Meeting at Newport. Paper by A. H. Dyer.
28.—Scottish Western Juniors.—Visit to Alder & Mackay, Ltd., Edinburgh.

There will be no meeting of the Central Executive Board of the National Gas Council, or of the Central Committee of the Federation of Gas Employers during the month of November.

Personal

Councillor J. TOWNSLEY, who (as already announced in the "JOURNAL") has retired from the position of Engineer and Manager of the Ashton Gas Company, in order to join the Board of Directors of the Ashton and the Mossley and Saddleworth Gas Companies, was the guest of honour at a recent luncheon at Ashton-under-Lyne when he was presented with a silver salver by the Chairman and Directors of the Ashton Undertaking to mark his retirement. Mr. G. M. Gill, M.Inst.Gas E., of the Palatine Gas Corporation, presided.

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We learn that Alderman CHARLES WITTS, Chairman of the Hereford Gas Committee, has resigned his membership of the Council after 52 years' unbroken service.

Alderman Witts has been Chairman of the Gas Committee for 30 years, and under his guidance tremendous strides have been made in that Department. The Works has always been kept up-to-date, and modern showrooms have been built in Widemarsh. He was Mayor of the City in 1904-5, and was elected an Alderman in 1905. His resignation has been accepted with the greatest regret, and the Council are to place on record their appreciation of his valuable services.

Obituary

J. C. WALKER.

The burial of James Cuthbert Walker, General Secretary of the British Commercial Gas Association (whose death, following upon an operation, was announced with deep sorrow in last week's issue of the "JOURNAL"), took place on Tuesday, Nov. 10, in Brompton Cemetery, and was preceded by a largely attended service at the Church of St. John the Divine, Bedford Hill, London, S.W. In addition to members of the family and other relatives and private friends, there were present, or represented, many of those friends with whom Mr. Walker had been associated in the good work upon which he had for so long been engaged on behalf of the Gas Industry.

Among those attending were noticed Mr. W. J. Sandeman, General Manager of the Croydon Gas Company (representing the President and Vice-Presidents of the British Commercial Gas Association), Mr. H. Stanley Taylor, Chairman of the Bath Gas Company (Immediate Past-President), Mr. W. D. Rowe, Manager of the B.C.G.A., and members of the staff, Mr. F. Pierson (representing Sir David Milne-Watson), Mr. J. R. W. Alexander (British Gas Federation and The Institution of Gas Engineers), Mr. W. J. Smith (National Gas Council), Mr. M. W. Burt (Society of British Gas Industries), Mr. J. Harding (British Sulphate of Ammonia Federation), Mr. P. G. Somerville (National Benzole Association), Mr. R. Girdlestone Cooper (Gas Companies' Protection Association), while Mr. J. E. Henwood, of the Gas Light and Coke Company, represented Mr. Stephen Lacey, President of The Institution of Gas Engineers.

Others present included Mr. Walker's old business associate and close friend, Mr. W. M. Mason, but, unfortunately, Sir Francis Goodenough was prevented by a chill from attending. Mr. S. E. Whitehead, Engineer and General Manager of the Southampton Gas Company, represented Sir Russell Bencraft, a Past-President of the B.C.G.A.; while Mr. A. Tennant represented Mr. W. H. Bennett, Managing-Director of the East Surrey Gas Company. We also saw Mr. F. B. Richards, Chairman of the Society of British Gas Industries; Mr. C. F. Botley, of Hastings; Mr. George Dixon, of Nottingham; Mr. H. M. Thornton, of Richmonds Gas Stove Company, Ltd.; Mr. R. J. Sykes, Chairman of the London Press Exchange, Ltd.; Mr. T. P. Ridley, of Newcastle; Mr. A. M. Wilkinson; Mr. T. F. C. Potterton, of Thomas Potterton (Heating Engineers), Ltd.; Mr. A. Broadbent and Mr. J. Hadden, representing Mr. W. R. Edgar, of Messrs. W. Edgar & Son, Ltd., and Mr. C. S. Shapley, of Leeds. Messrs. Walter King, Ltd., were represented by Mr. Alfred Harrison.

There was a profusion of beautiful floral tributes, among the senders of which were the President and Vice-Presidents and Members of the British Commercial Gas Association, the Staff of the Association, Sir David Milne-Watson, The Institution of Gas Engineers, the President and Members of the National Gas Council, and the officers and staff of the Council, Old Colleagues of the Gas Light and Coke Company, Manchester and District Association of Gas Engineers, President and Members of the Southern Association of Gas Engineers and Managers, Wales and Monmouthshire Association of Gas Engineers and Managers, Women's Gas Council, Yorkshire District Committee, Associated Gas and Water Undertakings, Ltd., British Sulphate of Ammonia Federation, Gas Companies' Protection Association, London and Counties Coke Association, London Press Exchange, Ltd., Caledonian Gas Corporation, and Society of British Gas Industries.

There were also wreaths from the Harrogate Gas Company, the Smethwick Corporation Gas Department, the Southampton Gas Company, the Tottenham and District Gas Company, the Wandsworth and District Gas Company, the York Gas Company, Mr. J. R. W. Alexander, Mr. C. R. Averill, Sir H. Russell Bencraft, Mr. and Mrs. H. E. Bloor, Mr. William Cash, Alderman George Clark, Mr. H. Creasey, Mr. W. D. Elson, Mr. George Ewart, Dr. Bernard Friedman, Sir Francis Goodenough, Mr. A. Hittinger, Mr. J. Jamieson, of Edinburgh, Mr. J. W. Kay, Mr. W. M. Mason, Councillor Walter Muter, Messrs. A. B. and T. F. C. Potterton, Mr. W. D. Rowe, Mr. A. W. Smith, Mr. W. J. Smith, Mr. and Mrs. P. G. Somerville, Mr. J. Sandon Stubbs, Mr. and Mrs. R. J. Sykes, Mr. H. Stanley Taylor, Mr. R. Taylor, Mr. H. M. Thornton, Mr. Douglas W. Turner, Mr. J. Wesley Whimster, Col. A. Wilkinson, Electrolux, Ltd., "GAS JOURNAL," W. C. Holmes & Co., Horstmann Gear Company, Ltd., Radiant Heating, Ltd., Radiation Ltd., and William Sugg & Co.

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The death occurred on Nov. 11 of Sir TRUSTRAM EVE, at the age of 71, after an illness of several weeks. He was a great expert on rating and the valuation of real property.

Herbert Trustram Eve was born on June 4, 1865. After leaving Bedford Grammar School he devoted himself to his father's business, and became head of the firm of J. R. Eve & Son on his father's death in 1902. He became a Fellow of the Auctioneers' and Estate Agents' Institute in 1913, and served with distinction on the council for 20 years. He was elected a Fellow of the Surveyors' Institution in 1891. He was also a Past-Chairman and first Hon. Secretary of the Rating Surveyors' Association. When the Rating and Valuation Act was passed in 1925 he carried out valuations all over the country and was county valuer for Bedfordshire. He was head of the panel of valuers for Hertfordshire, and was retained by many rating authorities in Buckinghamshire, Essex, Hampshire, Nottinghamshire, and Derbyshire. In 1928 he had a staff of over 100, with offices in many counties.

Sir Trustram Eve was retained in important rating and compensation cases, for to an exceptional grasp of the law and practice of assessment and the compulsory sale and purchase of property he added great ability in the witness-box.

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The death recently took place at Berwick-on-Tweed in his 87th year of Mr. ALEXANDER LAWSON, for many years a Director of Berwick and Tweedmouth Gaslight Company.

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The death occurred on Friday, Nov. 6, of Mr. CORNELIUS EDWARD SHARP. He was cashier of the Boston Gas Light and Coke Company, and had been employed by the Company for forty years. He was 60 years old.

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Following a severe attack of pneumonia, the death occurred at his home on Nov. 11 of Mr. A. B. STEDMAN, Secretary of the Reading Gas Company. Mr. Stedman, who will be greatly missed by all connected with the Company as well as by a large circle of friends in Reading, entered the Company's service in March, 1897, and was appointed Assistant Secretary in 1909. When, in the following year, Mr. A. C. Williams, who was then the Secretary, left to take up a similar appointment at Edinburgh, Mr. Stedman was appointed to fill the vacancy.

Writing of Mr. Stedman, Mr. Douglas H. Helps, Engineer and Manager of the Reading Gas Company, says: "I have worked with many gas company secretaries, but never with a more capable, loyal, and helpful colleague."

Gas Journal Shewring Fund

Donations are invited to the Fund, full particulars of which were given in the "JOURNAL" for July 22. The Management of the Fund is in the hands of Messrs. F. G. Shaw (Buxton), W. W. Townsend (Colchester), and J. Bridge (Elland). All expenses having been guaranteed, the whole of the sums received will be applied, without any deduction whatsoever, to the benefit of the widow and children of Harold Shewring, by whose tragic death earlier this year they were left in distressed circumstances.

Cheques should be made payable to the "GAS JOURNAL," and crossed "Shewring Fund Account." All donations will be gratefully acknowledged by the Editor, who is Treasurer to the Fund.

We are pleased to be able to announce that the total to date amounts to £726 3s. 0d.

News in Brief

Contributions amounting to over £374 were made during the year ended Sept. 30, 1936, by the employees of the Wolverhampton Gas Company to various local charities.

An Average Price of £106 8s. 3d. was subscribed to the issue by tender of £103,883 4% preference stock by the Croydon Gas Company. The issue was announced in the "JOURNAL" for Oct. 28.

The Tender of Messrs. Henry Balfour & Co., Leven, Fifeshire, for the erection of steelwork in connection with the new gasholder has been accepted by the Appleby (Westmoreland) Town Council.

Work Has Been Started on the erection of new large workshops in Carliol Square, Newcastle-on-Tyne, for the Newcastle-upon-Tyne and Gateshead Gas Company. Existing property on the site is being demolished.

At Batley, in spite of two counter attractions, Miss Eccles' demonstrations of gas cookery were entirely successful; excellent arrangements were made by Mr. S. B. Dean, Engineer and Manager of the local Undertaking.

A Superannuation Scheme has been introduced by the Directors of the Swindon United Gas Company for the benefit of the staff and workmen. The scheme, we understand, will come into operation in January, 1937.

The Australian Gas Light Company, of Sydney, we are informed, have placed an order with Woodall-Duckham (Australasia) Pty., Ltd., for an installation of the latest Woodall-Duckham vertical retorts to be erected at their Mortlake Works.

An Interim Dividend of 2% actual, less income-tax, has been declared by the Directors of the South-Western Gas and Water Corporation, Ltd., on the ordinary shares in respect of the year to March 31, 1937, payable on Nov. 27. The Company's books are closed from Nov. 13 to 26, 1936, inclusive.

The Tenders sent in for the £25,000 4½% preference stock in the Barnet District Gas and Water Company were opened on Nov. 9 and amounted to a total of £69,940, at prices ranging from £125 per £100 down to the minimum of £120, the average price realized being £121 10s. 4d. The lowest accepted tenders were at £120 5s. per £100, such tenders receiving 30% of the applications.

Nutrition and Food Values formed the subject of interesting lectures given last week at St. Mary's Hall, Shrewsbury, by Miss E. Eccles, C.D.S., of Cannon Iron Foundries, Ltd. Practical advice was given to engrossed audiences, and a special session for members of the Women's Gas Council was extremely successful, doing much to consolidate the gas position in Shrewsbury.

Further Concessions to Prepayment Consumers are announced by the Swindon United Gas Company. This is the fourth reduction in five years, and will cost the Company about £3,000 a year. On and after the first collection in the New Year the rebate to slot consumers will be altered from the present uniform figure of 1s. 4d. in the £ to 1s. 4d. in the *first* £ and 2s. 6d. on each subsequent £.

The Autumn General Meeting of the Midland Association will be held at the Grand Hotel, Birmingham, on Thursday, Nov. 19. After the usual business proceedings, Papers will be presented by Mr. F. Shewring ("Reconstruction at Stratford-on-Avon Gas-Works") and Mr. J. G. Cleator ("Automatic High-Pressure Gas Compressing and Storage Plant at Cirencester"). The Meeting will be preceded by an informal luncheon at 1 p.m.

The Quality of Gas at Wigtown has recently been greatly improved. It will be recalled that a few months ago the Wigtown Town Council, finding it impossible to run its Gas-Works without heavy loss, rented the entire plant to Mr. William Downie, of Cumnock, at £50 per year, with an option to purchase later. In the interval Mr. Downie has greatly improved the gas service, and it is now stated that his operations will show a profit of £150 for the year.

The Report of the Committee appointed by the Government to investigate the proposal to organize a gas "grid" in the West of Scotland to provide an outlet for by-product gas from iron works and collieries in Glasgow and Lanarkshire has, we understand, been received by Mr. Walter Runciman, President of the Board of Trade. It is recommended by the Committee that Glasgow and other local authorities should enter into negotiations with the by-product producers with a view to absorbing 17½ million cu.ft. of gas daily. Mr. Runciman will present the report to Parliament at an early date.

Extensions are to be carried out at the Darlington Corporation Gas-Works. The tender of the Stockton and Riley Boilers, Ltd., Stockton, has been accepted for the supply of a Lancashire boiler; Messrs. J. Shewell & Co. (Successors), Ltd., have received the contract for the erection of a steel-framed building for the water gas plant; while Messrs. W. S. Hutton, Ltd., Darlington, are to carry out the foundation work.

About 800 Women of Chester-le-Street and district attended the first of two cookery demonstrations held recently in the Empire Ballroom, Chester-le-Street, by the *Northern Echo* in conjunction with the College of Modern Housekeeping. They showed keen interest in the talk and practical cooking demonstrations by Miss Margaret Worth and assistants. The gas installation for the demonstration was carried out by the Newcastle and Gateshead Gas Company, under the direction of the local Manager, Mr. J. Jude. The Company also provided a refrigerator.

A Dividend of 3%, free of income-tax at 4s. 9d. in the £, on the ordinary capital of the Company is announced by the Directors of the Montevideo Gas and Dry Dock Company, Ltd. The dividend is made up as follows: (Final) 1½% in respect of the year 1934 (making with the interim dividend of 1½% paid July 8, 1936, 3% free of income-tax for the year 1934) as declared at the General Meeting of Stockholders held on July 7, 1936, and (Interim) 1½% in respect of the half-year ended June 30, 1935, declared by the Board at their meeting held on Nov. 10, 1936.

A High-Pressure Main is to be laid by the Walsall Town Council, who have approved a scheme prepared by the Gas Engineer, Mr. F. Davies. This 6-in. high-pressure main is to give a better supply to the Birmingham Road and Great Barr districts. The Council also sanctioned application for a loan of £12,310 to cover the approximate cost. Councillor Dean, the Chairman of the Gas Committee, pointed out that the districts had been inadequately serviced for a long time, owing to the building developments that had taken place since the existing main was laid.

A Successful Exhibition was recently held by the Burgh of Motherwell and Wishaw Gas Department in the Town Hall, Motherwell. The attendances at the cookery demonstrations given by Miss M. K. Gompertz, M.C.A., of Messrs. R. & A. Main, Ltd., amounted to over 2,000. This figure excludes the visitors to the exhibition outside the demonstration hours. The opening ceremony was performed by Mr. Thomas Ormiston, O.B.E., the chair being taken by Provost Chambers. Each speaker complimented the Department on the display and expressed their appreciation of the outstanding developments which were apparent in the apparatus displayed. Mr. A. McDonald, B.Sc., Engineer and Manager, informs us that the business resulting from the exhibition was more than satisfactory.

Amalgamation and Grouping

Basingstoke and Associated Utilities, Ltd.

We are informed that, owing to the acquisition of the majority of the ordinary stock of the Basingstoke Gas Company by Associated Utilities, Ltd., whose registered office is at 92, Victoria Road, Aldershot, the control and direction of the Basingstoke Company will hereafter be conducted by the Directors of Associated Utilities, Ltd., and the principal office of the Basingstoke Company will be removed to that address.

Otherwise the identity of the Basingstoke Gas Company will remain unchanged, and it is hoped, and indeed confidently anticipated, that its association with a large group of similar undertakings already under the control of Associated Utilities, Ltd., will result in such economies being effected as will be of eventual benefit to all parties concerned.

Associated Utilities, Ltd., is, of course, a corporation controlled by the Mid-Southern Utility Company of the same address, statutory suppliers of electricity, gas, and water over a very large combined area, and whose total capital resources amount to nearly two million pounds.

Mr. Herbert C. Higgs, Managing Director and Secretary of the Basingstoke Company, continues in an advisory capacity until Dec. 31, and until then all communications should continue to be addressed to him.

South Metropolitan Tariff

Joint Parliamentary Committee

The House of Commons on Wednesday night, Nov. 11, agreed to the setting up of a Joint Committee of Lords and Commons to enquire into the powers of regulating charges possessed by the South Metropolitan Gas Company and other gas companies authorized to operate under a basic price and basic dividend system, and to consider whether adequate protection is accorded to the interests of the different classes of gas consumer under those powers.

Women's Gas Council

Mr. A. Cook Addresses Warrington Branch

The members of the Warrington Branch of the W.G.C. met in the Warrington Gas Department's showrooms, Buttermarket Street, on Wednesday afternoon, Nov. 4, under their President, Mrs. Brereton Fairclough, and two Vice-Presidents, the Mayoress, Mrs. J. Poole, and Mrs. Cook, to hear an Address, illustrated by lantern slides, by the Engineer and Manager, Mr. A. Cook.

Mr. Cook gave a thorough survey of the large number of by-products, mentioning in particular a smokeless fuel "Clenco," a type of coke with high volatile content which makes it ignite easily.

Mrs. Brereton Fairclough, in voicing the members' thanks to Mr. Cook for his instructive Address, spoke of the value the visit to the Longford Gas-Works of the Warrington Corporation had been to the members.

Institution of Gas Engineers

The Beit Fellowships

Applications for the Beit Fellowships for Scientific Research, which were founded and endowed by Otto Beit (London) in 1913 "to promote the advancement of Science by means of Research," must be received on or before April 8, 1937. Copies of the Conditions of the Award and the Form of Application may be obtained from the Secretary of The Institution of Gas Engineers (Mr. J. R. W. Alexander), 1, Grosvenor Place, London, S.W. 1.

Not more than three Fellowships, each of the annual value of £240 and tenable for a period of two years, will be awarded on or about July 9, 1937, to candidates, under the age of 25 years, who "are of marked promise and are likely to become researchers above the average." The Beit Scientific Research Fellows work for the whole of their time under the supervision of a Professor of a Department of the Imperial College of Science and Technology and must not, without permission, take or hold any appointment whether paid or unpaid. Applicants have to state the general character of the research which they propose to carry on, but the Trustees specify the work of research which they are authorized to carry on.

Every Fellow shall be a person, man or woman, of European descent by both parents, but otherwise of any nationality whatsoever, who at the date of election shall have taken a degree in any Faculty in any University in the British Empire approved by the Trustees, or have passed the examinations which would have entitled him or her to take any such degree, or is in possession of any Diploma or Associateship of any College approved by the Trustees.

Cenotaph Floodlighting in Manchester

High-Pressure Gas Lamps

The Cenotaph, erected to the design of Sir E. Lutyens, which stands in St. Peter's Square in Manchester, is floodlit throughout the year by the Manchester Gas Department, and we hear that officials of the British Legion have been particularly complimentary on the effects produced, as furthering the interests they have at heart. The apparatus consists of 10 specially designed Keith high-pressure projector lamps focused from adjacent standards upon the monument, which thus becomes a nightly landmark.

During Armistice week an adjoining grass plot was used as a "Field of Remembrance," and this also was floodlit by means of 6 Parkinson "Flood-lite" lamps placed on the steps of the memorial cross, which marks the site of the church that originally occupied the site, in its centre. The Gas Department arranged a reminder of the purpose for which this was to be used in the shape of the words "Garden of Remembrance," which, worked in Flanders Poppies and edged with Forget-me-Nots on a silver background at the base of the cross, were illuminated by the "Flood-lite" lamps.

The Gas Light and Coke Company

Extraordinary General Meeting

An Extraordinary General Meeting of the Gas Light and Coke Company was held at the Chief Office of the Company, Horseferry Road, Westminster, S.W. 1, on Friday, Nov. 13, Sir DAVID MILNE-WATSON, LL.D., D.L., the Governor, presiding. Resolutions sanctioning the raising of a sum not exceeding £3,000,000 by the creation and issue of redeemable or irredeemable preference stock, and sanctioning the raising, in respect of such preference stock as and when issued, of additional money by borrowing on mortgage of the Undertaking of the Company or by the creation and issue of redeemable or irredeemable debenture stock were carried.

In the course of his remarks, Sir David Milne-Watson said: You will remember that at the Company's General Meeting held here last February I explained that we were supplying a record number of gas appliances to our customers and, in consequence, we were in need of additional capital to finance further development. Our powers for raising further capital having been exhausted, we promoted a Bill in Parliament for the purpose of giving the Company authority to raise £3,000,000 additional share capital. On July 31 last the Royal Assent to the Bill was received. The raising of the further £3,000,000 share capital now authorized would also give the Company power to raise additional loan capital up to £1,875,000—*i.e.*, 62½% of this new share capital and the Directors have deemed it advisable to ask for sanction to raise this loan capital also when necessary.

The additional capital is required for the repayment of the existing loan from the bankers of £1,600,000 and for increased expenditure.

With regard to the hire-purchase of stoves, the terms we offer are advertised in a very attractive manner and are appreciated by the public. This is shown by the fact that in June, 1934, the total sum outstanding on hire-purchase contracts amounted to £645,000, but in June last it had increased to £2,688,000—over four times as much. The total sales during the nine months ended September last amounted to £1,630,000. The policy of exchanging the old-fashioned cookers for modern enamelled cookers at reasonable hire rates is proceeding apace to the satisfaction of our many automatic customers. The number of stoves exchanged since the beginning of this year is 144,000 at a cost of £715,000. The total number to date since the inception of this policy two years ago is 242,000, which has involved an expenditure of £1,250,000.

We are continuing to install the new type of meter in place of the old style, a replacement of 84,000 having been made to September this year at a cost of £233,000.

We have also found it necessary to purchase at a cost of £129,000 three new steamships for our fleet of colliers to replace those which have given good service for many years but are no longer economic to run.

We are continuing to do excellent business. The sales of appliances, as I have already mentioned, are rapidly expanding and the gas consumption is increasing very satisfactorily; in fact, we have beaten our own record so far this year.

Manchester and District Junior Gas Association

Visit to Bryan Donkin Works

Nearly one hundred members of the Manchester and District Junior Gas Association visited Chesterfield on Wednesday, Nov. 11, to inspect the works of the Bryan Donkin Company, Ltd.

There was a great variety of plant and machinery in various stages of production to be seen during the tour of the works, which cover an area of eight acres and employ 700 people.

The multiplicity of the Bryan Donkin productions necessitates a very large pattern shop in which the members showed great interest; but the two iron foundries claimed the most attention, although the machine, fitting, and testing shops were not without interest. On every hand could be seen parts of plant, with which everyone connected with gas-works was familiar. There was a 36-in. double-faced gas valve in process of manufacture, and close to it were some special castings ready for despatch. Everywhere there were old friends—exhausters, compressors, boosters, governors, &c.

In view of the present distribution problems it was not surprising to find that the Reynold's district governors received special attention. The tools and machinery throughout the whole of the works were of a very high order, and it is worthy of note that practically all are of

British manufacture. The care and attention that is given to detail work in all stages of manufacture was remarkable. Particularly is this the case with exhausters, and undoubtedly the reliability of the products of the Bryan Donkin Company is due to the efficiency and thoroughness shown throughout the works.

The members were entertained at luncheon and tea by the Company at the Station Hotel, Chesterfield, at which the Managing Director of the Company, Alderman G. Clark, J.P., was present.

Mr. A. K. COLLINGE (Preston) proposed a vote of thanks to the Company, which was seconded by Mr. H. C. APPLEBEE (Manchester).

Alderman GEORGE CLARK, J.P., the Managing Director, in responding, stated that with the present tendency towards amalgamations, the number of appointments for Engineers and Managers would become fewer. He therefore urged them to concentrate upon the sales and distribution side of the Industry.

The PRESIDENT (Mr. T. Caldwell) thanked the guides and all those who had contributed to the success of the visit.

A "Thousand Cakes" Competition

Our photograph shows the window at Holdrons, of Peckham, in which are displayed the prizes which are being offered by the South Metropolitan Gas Company in connection with the "Thousand Cakes" Competition referred to on p. 424 of last week's "JOURNAL." A hundred prizes are being presented by the Company and by Messrs. Holdrons, the first consisting of goods to the value of £12.

Cooking for Mrs. Modern*

Parkinson's New Book

A new cookery book, if it is to take rank with the classics of the Art, must approach the subject from a modern angle. The practice of home cookery to-day is influenced by a growing interest in the principles of diet. Scientific precision is replacing empirical methods. At the same time, the field of interest has been widened and there is a spirit of adventure in the quest for new recipes from other countries.

"Perfect Cooking," just published by Parkinsons, is the latest addition to the lore of gas cookery, and it passes out from a critical examination with flying colours. It is pleasant to look at and to handle, being stoutly bound to withstand any amount of wear, and is illustrated with plenty of first-class photographs which explain such practical points as the placing of food in the oven, the icing of cakes, and the egging and crumbing of fish.

The sections on diet are particularly sound, well informed, sensible, and complete. The basis of good diet is analyzed and explained. Full advice on the feeding of growing children, schoolchildren, invalids, &c., is given. A scheme of practical menus for an ordinary family is clearly presented. The importance of proper diet is widely appreciated to-day, and many readers will be grateful for the sympathetic guidance given in this part of the book.

Most of us judge a new cookery book by the variety and completeness of its recipes, and "Perfect Cooking" gives good measure, pressed down and overflowing. It contains nearly 1,000 tested recipes, sectionalized and indexed. These include all the favourite English dishes and many more besides. Among the mouth-watering novelties a group of sixty foreign dishes is the most prominent. There are thirty recipes for salads and nearly as many recipes for home-made sweets. Cocktail and bridge party savouries and a number of home-made beverages are other features of a really outstanding book which will help to enhance the prestige of gas cooking.

*"Perfect Cooking." A comprehensive guide to success in the kitchen. Compiled by Gwen N. Hughes (Parkinson Stove Company).

British Association for Commercial and Industrial Education

Sir Francis Goodenough's Address

Sir Francis Goodenough, C.B.E., Chairman of the Council, presided over the opening session of the Third Annual Conference of the British Association for Commercial and Industrial Education, at the Regent Street Polytechnic, London, on Thursday, Nov. 12, 1936. Sir Francis read a message to H.M. The King who, when he was Prince of Wales, was Patron of the Association (and before that of the International Congress on Commercial Education, organized by the body that afterwards became the British Association for Commercial and Industrial Education).

Sir Francis then read messages from His Majesty and H.R.H. The Duke of York, who is now Royal Patron of the Association.

In welcoming the members and visitors attending the Conference, Sir Francis said: I am greatly pleased to see such an attendance because I feel that the work that is being undertaken—as outlined in the Annual Report of the Council for the past year and as demonstrated in the reports issued by the Association, particularly that dealing with an enquiry into "Vocational Education after General Education up to the age of Sixteen" is of real importance and interest to the whole industrial and commercial life of this great industrial and commercial nation, and should be supported in a very widespread and wholehearted manner.

I have many times stressed, what I have long felt and endeavoured to emphasize, the importance of commerce as the active partner of industry in making the wealth created by industry available for the support of life of every stratum of our national life. For without commerce and the profits resulting from it, none of us could exist, and I feel that it is His Majesty the King's gift for recognizing and supporting fundamental realities and not merely ornamental activities that has made him—and continues to maintain him—as the leader of thought and energy in the world of industry and commerce throughout the Empire.

One of the fundamentals on which he has fastened and laid stress for years is the satisfactory education and training of all grades of the personnel engaged in industry and commerce which, if neglected, would lead to the downfall of this great mercantile nation as a whole.

It is his realization of the fact that, unless through efficient commerce you can sell the goods and services produced by industry, the nation cannot maintain its position in the world, that has led him to give his support and countenance to the activities of this Association. For that support we are deeply grateful and are encouraged to a spirit of hopefulness in our work in the future.

I should like to say how much we are indebted also to Lord Eustace Percy for his leadership as our President.

Advertising Scoop for Gas Fires

Infra-Red Photography

"Every picture tells a story," and the infra-red photographs by Radiation for their new gas fire advertising has made a "story" indeed.

The advertisements, which we understand are appearing in all the big National newspapers, reproduce actual untouched photographs that were taken with infra-red plates and filter equipment, under conditions that were very carefully controlled by their Technical Staff. The "news" value of such an advertising story is unquestioned. The captions themselves are brief but very much to the point, and this series should certainly be of immense advantage to the Industry.

Once again we feel that Radiation Ltd. are to be congratulated, both on their keenness in recognizing these possibilities in infra-red photography and in turning them so brightly to account for publicity purposes.

The Coal Situation

Mr. C. S. Shapley Addresses Yorkshire Juniors

At the 33rd Annual General Meeting of the Yorkshire Junior Gas Association on Oct. 17 [reported in the "JOURNAL" for Oct. 21], Mr. C. S. Shapley, Engineer and Manager of the Leeds Gas Department, addressed the members on several aspects of the Gas Industry.

After remarking that many juniors may not quite realize the vast amount of time and attention many seniors gave for the good of the Industry, without hope of personal reward for themselves, Mr. Shapley said he felt he could hardly allow the opportunity to go by without making some reference to that all-important subject of the moment—coal supplies and costs. This was one of the Gas Industry's main expenses, and every man in the Industry, whatever his position, ought to be aware of the general facts of the present coal situation. Although he was the representative of the Yorkshire Gas Industry on the Central Coal Consultative Committee in London, it must be understood that anything he said that afternoon was his own view, and not necessarily that of the National Gas Council or the Conjoint Conference of Public Utility Associations. It had been his duty to give a good deal of time lately to the negotiations between the coal owners, the Government, and the consuming industries. Everybody would agree that the coal miner should be adequately paid for his labour; and he fancied that most people would agree that in some instances this had not been the case.

"The public," he continued, "has been carefully worked up, through certain influences on the popular Press, to the belief that *every* miner is badly paid. That is by no means the case. One of the reasons for low pay of miners has been the necessity in exporting areas to meet low price foreign competition." There were, however, many areas in which the miner's pay was not inadequate to his work, and Mr. Shapley quoted actual facts in relation to Yorkshire supporting this view. However, he said, the coal people persisted in the plea that they had no money, and the Government pressed the Gas Industry to assist by a voluntary increase of one shilling per ton on their coal. This, they were told, was to stave off a threatened national emergency. "We suggested district settlements. It worked very well in our Industry, and we suggested a national pool. Public utility undertakings staved off this threatened national emergency at the behest of the Government; but when the increases in prices of new contracts are brought to light we might well be inclined to ask 'Has a national emergency been staved off?' The coal owners seem to think the public utilities are a milch cow, and can easily pay shillings more per ton for coal and pass the increase on to their consumers. One is inclined to wonder whether, if we do that as readily as they and the Government seem to think we can, there is not likely to be as awkward an emergency as before."

One of the difficulties in this matter was that whereas the men who represented the gas and kindred industries were men who knew the ramifications of their industries from the point of view of working conditions, the coal industry was represented by owners, not the men engaged in the industry's practical working. To his mind, Government interference had done the coal industry no good; and it had certainly caused difficulties for consuming interests. There was far too much Government interference in industry nowadays. If the Government would leave industry alone it would be better for everybody.

Describing the slow processes of investigation of questions at issue between coal owners and those who had to make contracts for supplies, Mr. Shapley said as Yorkshire representative of the Gas Industry on this Consultative body he would not like to say he was prepared, under such conditions, to be held responsible for trying to settle the coal contract problems of his friends in the Yorkshire Gas Industry—otherwise he would soon have no friends left! The Gas Industry, the electrical industry, the water industry, and the poor old householder all seemed likely to suffer alike under this Coal Mines Act. So far as concerned gas, at any rate, it was encouraging to think there may be ways out of the situation. They had the possibilities of water gas and they were not without their scientific research workers. If coal was going to continue rising in cost, making more and more difficulty for the Gas Industry, then it seemed to him that it was up to the Gas Industry to show that it could do with less and less coal, and still keep its public supplied with a first-class gas service.

Vote of Thanks.

Mr. J. W. WOOD, M.Sc., moving thanks to Mr. Shapley for his Address, said the meeting appreciated his presence there because they knew how ready he always was to support the Association. So far as concerned this great problem of coal supply, Mr. Shapley had thrown out something in the nature of a challenge to the research section of the Industry. To him (Mr. Wood), the problem seemed quite simple. All they had to do was to wait until the Government and its committees had thoroughly digested all the complaints and then carbonize the lengthy Minutes recording the proceedings!

Mr. A. WYLIE (Sheffield), seconding, said Mr. Shapley had given the younger people in the Industry a touch of encouragement and a sense of true values which would stand them in good stead. He hoped the optimistic note struck by the day's Address would be the dominant spirit of the Association throughout the new session.

Co-Partnership at Watford

£25,000 of Stock Allocated to Employees

The twenty-seventh Annual Meeting of the employees of the Watford and St. Albans Gas Company was held on Tuesday, Oct. 27, at the chief showrooms at Watford. The Chairman and Managing Director, Mr. Frank H. Jones, presided, and was supported by Messrs. Henry Brown (Deputy-Chairman), R. T. Kent, C. Chambers, H. N. Lipscomb, H. F. H. Jones (Directors), G. Wilks (Secretary and Commercial Manager), T. S. Godwin, T. C. Battersby, H. C. Dunbar (Works Manager), W. C. Cherry, L. J. Kerrison, F. Painton (Works Representatives), B. H. Almond, and E. T. Warren (Officials).

Mr. Jones referred to the fact that it was 27 years ago that Co-Partnership was started in the Company with a mere handful of co-partners. He was sorry to say that he was the only Director left who was on the Board at the time the scheme was commenced. During the 27 years, Co-Partnership had made rapid strides in the Company, and hundreds of employees now reaped the many benefits. Over £25,000 of the Company's stock had been allocated to the workers. The bonus and interest for the year to June 30, 1936, amounted to nearly £6,000, and this had all been credited to the employees' accounts, and much of it later would be used for the purposes of transferring yet further stock to them. Continuing, the Chairman said that he had spoken to some of the older employees many times on the subject of Co-Partnership, but when he looked round and saw so many younger people at that meeting he thought he ought to say once again that Co-Partnership was really like a garden and, as such, had to be tended with care and enthusiasm. The scheme had threefold benefits, to the consumer, the shareholder, and the employee. Many of them, he said, were all three, and thus they would see how vitally they were affected by the progress and success of Co-Partnership. They should, therefore, still further increase the sale of gas and coke and the relative appliances, and at the same time carry out that good work which gave the Company contented consumers.

Referring to the Pension Fund, Mr. Jones stated that thirty-one people were now receiving moneys from that Fund which had assets amounting to over £55,000 invested mostly in gilt-edged securities. The Company's contribution to that Fund and to the new Group Life and Pension Scheme amounted for the year to over £7,000, this amount together with the sum required for Co-Partnership and increased wages under the Grading Scheme amounted to £16,000 per annum. The Company had been good, he thought, to their employees, but they, in their turn, were doing what they could to help those who were not in such fortunate circumstances as themselves. This they had done by contributing £214 to local hospitals and societies. "It is very pleasing to note," he said, "the good social spirit which obtains in the Company as is shown by the number of sports clubs which are doing very well." He understood that an Operatic and Dramatic Society had recently been formed, and he looked forward to seeing their first play, "Our Miss Gibbs."

Mr. L. J. Kerrison was re-elected Works Representative on the Co-Partnership Committee, and Mr. T. C. Wall was again elected as Co-Partnership Auditor. Honoraria were granted to Mr. E. T. Warren, Assistant Secretary, Messrs. Ferguson-Davie & Co., Directors' Auditors, and Mr. T. C. Wall, Co-Partnership Auditor.

Mr. C. S. Knowles then proposed a hearty vote of thanks to the Chairman and members of the Board for all they had done for the Company and for the welfare of the workers. Mr. F. G. Wells also made reference to the many kindnesses shown by the Board.

The Directors then entertained all present to tea, after which much interest was evinced in the exhibition of photographs, drawings, and paintings by co-partners.

Joint Council Meeting of The Junior Gas Associations

The Annual Meeting of the Joint Council was held in the City Chambers, Glasgow, on Saturday, Sept. 26, 1936— Mr. JOHN WEBSTER (President of the Scottish Western Association) presiding.

The delegates attending were: Messrs. W. Kirk and R. A. Maclaren (Scottish Western), R. Summerson and F. H. Higton (London and Southern), T. Caldwell, F. Johnston, and A. K. Collinge (Manchester and District), F. Jenkins, E. T. Pickering, and Alfred Hill (Midland), J. H. Chapman and R. S. Snelling (Wales and Monmouthshire), S. B. Jones, J. E. Akroyd, and K. L. Clark (Western), E. R. B. French and R. H. McCulloch (Yorkshire), W. J. Pickering, Educational Representative, and Alex. Bujnowski, Hon. Secretary and Treasurer.

The Chairman, on behalf of the Scottish Association, having extended a welcome to the delegates, the minutes of the Meeting of the Council held at Bath on Oct. 7, 1935, as circulated to delegates were taken as read, and on the motion of Mr. French and seconded by Mr. Clark were approved and signed.

The Secretary and Treasurer then submitted the Annual Report and Balance-Sheet which were approved and signed, the accounts having been duly audited.

Education Scheme Report.

Mr. Pickering then submitted his report on the Education Scheme, in the course of which he observed that the past session had been the 13th in the history of the Education Scheme, and the results, on the whole, had been fairly satisfactory.

As regards the examinations in Gas Engineering and Gas Supply, the Board of Examiners' Report was to the effect that the work submitted was generally good, and in most grades the average standard was higher than in 1935. They stressed, however, a general lack of practical experience and the need which still obtained in several of the grades for better sketching.

The figures for the numbers of Examinees for the Major Courses were as follows:

—	1935.	1936.
External	119	130
Internal	318	318
Total	437	448

The figures for the Minor Courses and Gas Fitting were as follows:

—	1935.	1936.
Gas-Works Practice	18	10
Gas Supply Practice	100	72
Total	118	82
Gas Fitting (total of all grades)	1,869	1,852
Grand total of all students	2,124	2,382

The percentages of passes in the Major Courses were very similar to the previous session; and as regards Gas Fitting, the results for the Final Grade examinations were better than for 1935, showing a total of 372 passes as compared with 278.

It was of importance and general interest that, as from Oct. 1, 1936, a Second-Class Higher Grade Certificate in Gas Engineering, Manufacture or Supply, would be sufficient for entry to the Diploma Examination.

Regarding the general education qualification for the Diploma, the Gas Education Committee had had to exercise its discretion in many cases on insufficient evidence. On and after Oct. 1, 1936, therefore, candidates for the Diploma Examinations who could not produce the usual Educational Certificates or other satisfactory evidence as to the standard of their general education would be required to submit themselves to an Examination conducted by the Institution and consisting of:

1. An essay.
2. A general knowledge paper.
3. A conversation based more or less on the candidates' work under 1 and 2.

A point concerning the Gas Fitting Examinations of the City and Guilds of London Institute was that the oral part of the examinations would be discontinued from and including the 1937 examinations.

Moderation of Questions.

This year an attempt was made by the Gas Education Committee to make the meeting of this body more effective, and the experiment met with a good measure of success. The proceedings in the past had not given much opportunity for useful discussion, but at the meeting on June 23 such opportunity was afforded and utilized. The question of examination papers was dealt with at some length and the moderation of questions generally was seriously engaging the attention of the Education Committee. This matter had rightly concerned the Junior Associations for some time, and proper machinery for really satisfactory "moderation" would be set up very shortly.

As regards the Constitution of the Consultative Committee, the Gas Education Committee resolved to recommend the Council to amend the Education Regulations, with effect from Oct. 1, 1936, so that, in place of the Consultative Committee, an annual Gas Education Conference would be convened for the purpose of attending a particular conference.

Each representative or nominee would serve, subject to his remaining qualified, for three years, and retire in each group in rotation, but be eligible for re-election.

The Examiners of the City and Guilds of London Institute in Gas-Works Practice, Gas Supply Practice, and Gas Fitting would be regarded as members of the Board of Examiners for the purpose of attending the Conference. The object of this alteration was to provide for an Annual Conference with a definite and representative membership and with effective proceedings.

In conclusion, their best thanks were again accorded to all those who had been associated with the working of the Education Scheme during the past session, and in particular to the Institution Secretary and his Staff, and to all the various District Education Committees.

Visit to the B.I.F.

Continuing the business of the Council, it was reported that a joint visit of members of the Affiliated Associations to the British Industries Fair took place on Feb. 20, 1936, when the members, numbering 270, were guests at luncheon of the President and Council of the Birmnigham Chamber of Commerce.

The toast of the "Gas Industry," proposed by Col. O. B. F. Planck, D.S.O., T.D., D.L. (Member of the Fair Management Committee), was responded to by Mr. F. H. Higton (London and Southern Junior Gas Association).

Luncheon.

After the Meeting the delegates were entertained at lunch in the North British Hotel by the Glasgow Corporation.

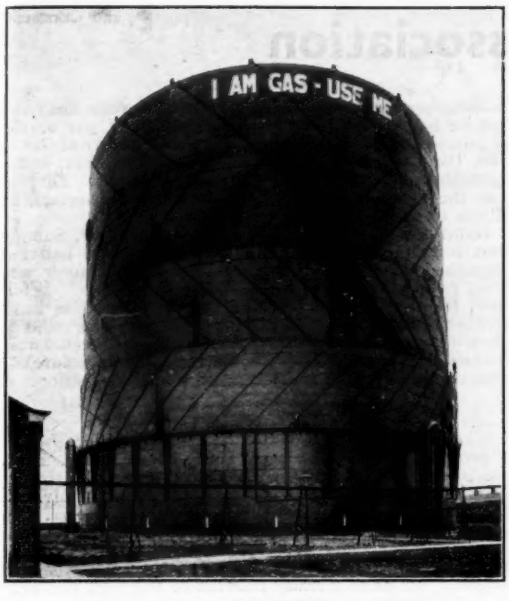
Bailie McIntosh (Convener of the Gas Committee) presided, and was supported by Mr. E. Edison Stones (Assistant General Manager) and Mr. D. D. Burns (Secretary and Treasurer) of the Glasgow Gas Department.

The delegates were welcomed by the Convener, and Mr. Roy Summerson (President of the London and Southern District Junior Gas Association) expressed the grateful thanks of the Council for the facilities provided for the meeting in the City Chambers and for the hospitality extended to them.

In the afternoon the party visited some of the Scottish Lochs, and tea was provided at Arrochar on Loch Long side.

Middlesbrough's New Gasholder Put to Work

On Nov. 5 Alderman S. A. Sadler (Chairman of the Gas and Electricity Committee) opened the valve which put the Middlesbrough Gas Department's new 4-million cu.ft. spiral-guided gasholder into service in the presence of a gathering of local Councillors and Gas Engineers from neighbouring districts.



One Day's Gas Supply for Middlesbrough.

A study of the Gas Industry in Middlesbrough from the time of the establishment of the Gas-Works in Lower Commercial Street by the Middlesbrough owners in 1838 up to the year 1856, when the Corporation purchased the Gas-Works from the Middlesbrough owners, and so on to the present day would reveal that the general rate of progress throughout the country has certainly been maintained in this district. To meet the growing demand the Corporation have constantly had to keep extending and modernizing the plant at their disposal, and it was on this score that this new (No. 7) gasholder came into being.

On Sept. 21, 1933, the Gas Manager, Mr. Charles F. Blincoe, reported to the Gas and Electricity Committee that a fracture had developed in the steel tank of No. 5 gasholder at the Marsh Storage Station, which rendered the whole structure unsafe for further use. The Committee decided to abandon the use of No. 5 holder, and to invite tenders for a new holder of 4 million cu.ft. capacity in a steel tank erected at the Cannon Street Storage Station. At the same time application was made to the Ministry of Health for sanction to borrow £67,000. Tenders were invited, and the Town Council confirmed the acceptance of the tender of Industrial Constructions, Ltd., for a piled and reinforced concrete foundation, while the tender of Clayton, Son, & Co., Ltd., was accepted for the erection of the new holder and tank. The Ministry of Health sanctioned the borrowing of the sum of £48,804.

The construction of the foundations was commenced on Sept. 14, 1934, and completed on Feb. 11 in the following year, and the erection of the tank and holder was commenced on Feb. 28, 1935, and completed on Aug. 11, 1936.

The holder is of the spiral-guided type of four lifts, the overall dimensions being as follows:

Inner lift	180 ft.	diameter by 37 ft.	6 in. deep
Second ,,	183 ,,	,, 37 ,,	6 ,, ,,
Third ,,	186 ,,	,, 37 ,,	6 ,, ,,
Outer ,,	189 ,,	,, 37 ,,	6 ,, ,,

The crown is of the trussed type and has a rise of 12 ft. To give access to the various lutes and the crown, the holder is equipped with step-ladders of the inclined staircase type. The gas inlet and outlet pipes are 30 in. diameter and are designed to prevent access of water to the town mains should they become fractured or leak below the water level in the tank. The tank is constructed of steel plates varying in thickness from $1\frac{7}{16}$ in. to $\frac{1}{4}$ in. and is designed with a factor of safety of not less than 4. It has a water content of 30,596 tons, or 6,778,000 gallons. The total weight of the steelwork in the holder and tank is 1,611 tons.

The foundations consist of a reinforced concrete raft 7 in. thick, with an outer ring 9 ft. 6 in. wide and 14 in. thick. This is supported on 921 concrete piles, 15 in. diameter, made *in situ*, and spaced at 6 ft. centres. The piles vary in length from 23 ft. 7 in. and the average length is 25 ft. $7\frac{1}{2}$ in. A test load of 60 tons was specified for each pile.

A gas-fired steam boiler has been installed to generate steam for use in the anti-freezing apparatus. The dimensions are 6 ft. 6 in. diameter by 9 ft. between the tube plates. The boiler has a heating surface of 1,000 sq.ft. and is capable of evaporating 3,000 lb. of water per hour with a working pressure of 120 lb. per sq.in. The station governor house is equipped with two 24 in. diameter governors. The outlet connection of No. 1 governor delivers gas through a 24 in. diameter trunk main to the Parliament Road Area, and thence by an 18 in. diameter main to the Linthorpe Road Area. From the outlet connection of No. 2 station governor a 24 in. and an 18 in. diameter trunk main has been laid for a distance of two miles through the western and southern areas of the Borough.

The erection of this new holder brings the total storage capacity in Middlesbrough up to 8,250,000 cu.ft.

The following contractors were engaged in the construction of the holder:

Clayton, Son, & Co., Ltd., gasholder and tank.
Industrial Constructions, Ltd., reinforced concrete foundations and piling.
Spencer-Bonecourt, Ltd., gas-fired steam boiler.
J. & J. Braddock, Ltd., 24-in. station governor.
W. C. Holmes & Co., Ltd., 30-in. and 24-in. diameter governor house valves.

The Inauguration Ceremony.

The holder was brought into use when Alderman S. A. Sadler, Chairman of the Gas and Electricity Committee, opened the valve in the presence of the Mayor (Councillor A. Elstrop), members of the Corporation, and Gas Engineers from all parts of the North-East.

At a luncheon in the Town Hall afterwards, provided by the principal Contractors, Clayton, Son, & Co., Ltd., Leeds, Alderman Sadler presided. He submitted the Toast of "The Contractors."

Mr. L. Hartley, M.I.Mech.E. (Director), responding on behalf of Messrs. Clayton, said that a promise was given when the contract was placed that at least 70% of the labour required would be recruited through the local employment exchange. Actually 80% of the labour had been thus engaged. Mr. Hartley complimented Middlesbrough on its progressive policy as exemplified in the provision of the gasholder.

Mr. J. J. Baines (another Director) presented silver salvers to Alderman Sadler and to Mr. Blincoe.

Mr. Blincoe said that the new holder would assist in coping with the heavy demand for gas at certain hours and the surplus make at other hours.

Mr. J. Corrigan (Brighouse), President of the North of England Gas Managers' Association, in proposing success to the Middlesbrough Undertaking, said that Middlesbrough stood very high in the Gas Industry. In the last 20 years its output had increased from 540 million cu.ft. to 1,181 million cu.ft. last year. The town had over 33,000 gas cookers in use.

The Mayor, in reply, paid tribute to the part played by the late Sir Joseph Calvert in the adoption by Middlesbrough of the system by which coke oven gas is used for town purposes, and added that Middlesbrough had in the past been grateful more than once for the contributions from Gas Department funds towards rate relief.

London and Southern District Junior Gas Association

Annual Dinner and Concert

At last we have discovered the real value of the Technical Press. According to Mr. R. N. LeFevre (Senior Vice-President), who proposed the Toast of "The Visitors" at the Twenty-Fourth Annual Dinner of the London and Southern District Junior Gas Association, the Technical Press, suitably torn up of course, makes excellent lagging for hot water systems!

Be this as it may, we cannot but record the fact that this annual function—held Nov. 13 at the Empire Restaurant, Victoria—was an outstanding success; and the President (Mr. ROY SUMMERSON, of Luton) must have felt gratified at the excellent support by members and their ladies as well as at the presence of so many distinguished guests. Among the latter may be mentioned the names of Mr. Stephen Lacey and Mr. J. R. W. Alexander (President and Secretary respectively of The Institution of Gas Engineers), Mr. R. J. H. Clark, of Plymouth, and Mr. W. A. Howie, of Gravesend (President and Secretary of the Southern Association of Gas Engineers and Managers), Mr. W. Phillips, of Luton, Mr. W. Grogono, of Croydon, Mr. W. L. Boon (General Manager of the London and Counties Coke Association), Mr. R. J. Milbourne, a Patron of the Junior Association and donor of the Milbourne Medal, and Dr. J. N. Long, Principal of the Westminster Technical Institute. There was, in addition, we believe, a record attendance of Past-Presidents of the Association.

The Loyal Toast having been duly honoured, Mr. W. PHILLIPS proposed "The London and Southern District Junior Gas Association," coupled with the name of the President. It gave him great personal pleasure, he observed, to propose this Toast because, as they all knew, Mr. Summerson was an important member of his staff at Luton, and he felt very proud that he should at that time be President of their Association. Roy Summerson, said Mr. Phillips, had been with him since he left college in 1918, and he had gained honours in the Institution and City and Guilds of London Examinations. He had had a very varied experience, as, in addition to being Chief Chemist at Luton, he had acted as Clerk-of-Works and Resident Engineer in connection with gas and water undertakings in Bedfordshire, Hertfordshire, and North Cambridgeshire.

The work of the Junior Gas Associations, went on Mr. Phillips, was of great value, not only to the members themselves, but also to the undertakings from which the members came. The Seniors found themselves more and more occupied with administrative duties while at the same time technical work increased and devolved more and more upon the Juniors. And the technical efficiency of the Gas Industry to-day was in no small measure due to the work of the Juniors. Associations such as theirs were of the greatest value in helping the Juniors to keep abreast of the times. Many Juniors were specialists, and many of these specialists were able to give great help to other Juniors where, perhaps, knowledge was not specialized. At the same time, the outlook of the specialists should be broadened by hearing Papers not directly connected with their own subject. The need for highly qualified men in the Gas Industry was very great to-day, and the Junior Associations were doing splendid work in helping to add to their qualifications and experience. Mr. Phillips was glad to know that the London and Southern District Junior Gas Association was going on from strength to strength. In 1928 their membership was just over 300; to-day it was over 500. This augured well for the future of the Industry.

The PRESIDENT, in responding to the Toast, said how much they appreciated the presence of Mr. Phillips on that occasion, and he would like to take that opportunity of expressing to him his thanks for the support he was giving him during his year of office. He would also thank Mr. Phillips and his Directors for their kindness in inviting the members of the Association and their ladies to Luton for their Summer Visit next June.

The successful functioning of their Association, went on Mr. Summerson, depended upon three things. First, it depended upon the facilities granted and the encouragement given by their Chiefs, and he was happy to acknowledge that they never failed in this respect. Secondly, it depended upon the work of the Council of the Association, which was, perhaps, not sufficiently recognized. The members of the Council put in many hours of work in addition to the ordinary meetings and visits in arranging the activities of the Association. Mr. Summerson observed that he had never worked with any voluntary body which was so happily united in their work than the Council of their Association. He paid tribute in particular to the hard work put in by their Hon. Secretary, Mr. Higton, to whom every President was indebted during his year of office, and by their Hon. Treasurer, Mr. Soar. He looked upon these unofficial exchanges of information and opinion as a very valuable part of the work of the Association. It was an interesting fact that, concerning this interchange of technical information, the utilization side of the Industry was now better equipped than the manufacturing and distribution sides. If anyone desired information or help in regard to the utilization of gas or coke he could immediately get into touch with the Industrial Gas Centre or with the London and Counties Coke Association; but works and distribution men had no such organizations. They had to rely on the Technical Associations, on personal contact, and on the Press to fill their needs.

He could not let that occasion pass, went on Mr. Summerson, without referring to three of their members who had recently distinguished themselves. Two of them—Mr. Hadow and Mr. Pinkess, read a Paper on "Small Gas Governors" before the Autumn Research Meeting of The Institution of Gas Engineers early that month, while Mr. Moys, of Croydon, who was a member of the Council of the Association, had been awarded a First-Class Diploma in Gas Engineering (Manufacture). They all congratulated these gentlemen on their distinction.

"The Visitors."

In proposing the Toast of "The Visitors," Mr. R. N. LE FEVRE referred with pleasure to their various guests on that occasion, and coupled the Toast with the name of Mr. Stephen Lacey, President of The Institution of Gas Engineers. In very humorous vein, Mr. LeFevre likened each of their visitors to the various component parts of a water heating installation, each in his separate sphere essential to the smooth working of the whole. We have already referred to the part the Technical Press is privileged to play in this somewhat complicated water heating system—for which information we are indebted to Mr. LeFevre—but over the different functions in this installation of the other visitors present it will, perhaps, be best to draw a tactful veil!

Mr. STEPHEN LACEY, in acknowledging the Toast, remarked how delighted he was to be with them once again at their Annual Dinner and to have the privilege of sharing with his friend, Mr. R. J. H. Clark, the privilege of responding to the Toast which had been so kindly proposed. On behalf of all the guests he thanked the Association for their generous hospitality and the excellent entertainment they always had at these gatherings. Referring to education, Mr. Lacey observed that the Institution, as the Senior Technical Body of the Gas Industry, was responsible, through the Education Scheme, for providing the necessary facilities for technical education of newcomers to the Industry; and in that connection he wanted to take the opportunity of expressing the grateful thanks of the Institution for all that the Junior Associations did. The furtherance of technical education had always been the keynote of their Association from its beginning thirty-five years ago. The original members, fellow students of gas technology, felt the need for an association which would keep them in touch with one another and provide opportunities for the interchange of ideas to assist them to apply their technical knowledge to advantage. The Association grew and prospered, and to-day were included in their membership those who had taken the Gas Manufacture and Supply Examinations at one time or another, a number of teachers at their Educational Centres, as well as some of the most distinguished chemists and physicists in the Gas Industry. It was appropriate that Mr. LeFevre should have proposed that Toast, because Mr. Lacey ventured to think that there was no one who had such an intimate knowledge of teaching gas subjects as he; he was the Officer in Charge of Training at Watson House and also Head of the Gas Department at the Westminster Technical Institute, which claimed credit for training half the students who took gas courses. Some people thought that more intensive and forceful methods were needed in regard to selling gas and that technical education was not quite so important as it used to be. But Mr. Lacey did not hold that view; the more forceful the selling the better the technical service must be. What they required to-day were salesmen with a technical background and technical men with a commercial outlook.

Mr. R. J. H. CLARK also responded to the Toast and expressed his appreciation of the Association's invitation and hospitality. This Association was the largest of its kind in the country, either Senior or Junior, and he was happy to represent the Southern Association on that occasion, as they were the second largest in point of numbers, to whom the London Juniors were affiliated. He welcomed the opportunity of saying how much in his own official capacity he enjoyed the backing of a staff whose loyalty and efficiency were second to none and how much he was helped by them and through their membership of a Junior Association. He said this as some little acknowledgment of his appreciation of the work which was being done by the Junior Associations throughout the country. The Gas Industry had a tremendous amount of useful work in front of it, and he looked forward to the time when the people of this country would give them the credit which was due to them for the work of national importance they were doing.

An excellent entertainment by a concert party completed a most enjoyable evening.

Coke Treatment Plant at Birmingham

by
D. W. G. SCOTT,
of the Windsor Street Works, Birmingham

From a Paper read before members of the Midland Junior Gas Association at a meeting in Birmingham on Thursday, Nov. 5—the PRESIDENT (Mr. F. A. Jenkins, of Leamington) in the Chair.

The increasing use of coke for domestic purposes has made it desirable that attention should be directed towards producing a coke specially suitable for the requirements of domestic grates. In the Birmingham area there are over 32,000 domestic users of coke, and up to date well over 10,000 coke grates have been fitted.

The industrial market—an important one in Birmingham—also demands consideration with a view to providing a clean and improved coke and breeze for industrial processes.

The question of satisfying the demands of both domestic and industrial markets has been met at Windsor Street by:

(1) Arranging for the production in the retort house of two types of coke.

(2) Modifying the coke treatment plant to deal with each type separately.

It is the coke treatment plant which I intend to cover in this Paper, but, before proceeding with that subject, it will be of interest, I think, to explain the arrangements which are made in the retort house.

The qualities of a coke are largely determined by the type of carbonizing plant in which it is made and by the choice of coals. The carbonizing plant at Windsor Street, consisting solely of continuous vertical retorts, has the advantage of producing the type of coke which is most easily combustible, and which satisfies the demands of Birmingham markets for a light coke.

The coals carbonized, which are drawn mainly from the Yorkshire, Derbyshire, and Nottinghamshire fields, give cokes which vary in character. Coke from Yorkshire coal is denser and more suitable for industrial purposes, while that from Derbyshire and Nottinghamshire coals is lighter, more freely burning, and, therefore, more suitable for household requirements.

In order to produce cokes with characteristics intended to suit both domestic and industrial markets, the carbonization of Derbyshire and Nottinghamshire coals is confined to particular ranges of retorts, and Yorkshire coal allotted to the remainder.

Approximately 30% of the coal carbonized in the retort house is allocated for the production of household coke, and in this way the screens receive, not an indiscriminate mixture, but cokes of two main types which are subject to separate treatment and have separate destinations.

Function of Plant.

In addition to the type of carbonizing plant and the types of coal carbonized, the correct treatment of the coke for consumers' satisfaction is of the greatest importance.

The function of the coke treatment plant at Windsor Street is to grade the coke correctly, dry-clean the smaller sizes with the addition of washing if desired, and remove breeze and dust formed during storage from the final product delivered to the consumers.

The grades supplied are:

Large coke	Above 2 in.
Small coke household and industrial	1⅛ in.–2 in.
Purified inch breeze	⅝ in.–1⅛ in.
Washed purified inch breeze	,, ,,
Purified bean breeze	⅜ in.–⅝ in.
Washed purified bean breeze	,, ,,

The term "breeze" is applied to sizes ⅜ in.-1⅛ in. and "dust" to material below ⅜ in. A further grade, "pea breeze," ¼ in.-⅜ in. in size, is also supplied.

The grade used for domestic grates is household small coke; the large coke produced on the household side of the plant is used mainly for the same purposes as industrial large coke.

At times of full winter loads the quantity of coke passing daily to the screens is approximately 1,000 tons, which is dealt with in 15 draws per day. The capacities of the various units have been chosen to cope with this load and leave sufficient margin to avoid overload; in addition, screens, elevators, and dry-cleaning tables, &c., have been provided in duplicate to facilitate repairs and to prevent delay due to breakdown.

Coke from the retort house is discharged into electrically propelled, battery powered skips travelling along rails under each range of retorts.

One of two overhead cranes picks up the skips from their chassis and carries them above the main receiving hoppers on the screening plant, where the coke is discharged by releasing hinged doors at the bottom of the skips.

An alternative means of feeding the receiving hoppers is provided in the form of a lipped bucket elevator which is filled by a third crane working at a lower level. Two of the four hoppers receive household coke and the remaining two industrial coke.

The coke from the four receiving hoppers is fed in a continuous stream by means of short elevator conveyors or "apron feed" on to four primary double-decker "Gyrex" screens which separate:

(*a*) Large coke (over 2 in.).
(*b*) Small coke (1⅛ in.-2 in.).
(*c*) Breeze and dust (through 1⅛ in.).

The large and small coke from the two screens receiving household coke goes to the household side of the plant, and from the remaining two to the industrial side, each side being separate. One screen in use on each side is sufficient to cope with the load, the remaining screen being kept as spare.

The breeze and dust from all four primary screens mixes and is removed by a common belt conveyor to be dealt with in secondary screens at the industrial end of the plant.

Household Coke.

Although the object of producing household coke is to provide a coke which burns more freely, the question of size is important. The size suitable for domestic grates is the small coke, but necessarily some large coke is also produced. Although it is unsuitable for household use on account of its size it can be broken smaller when required and provides a useful reserve at times when the demand for household small coke exceeds the supply.

Household large coke from the primary screens may be loaded by conveyor belt directly into trucks on an elevated railway running on each side of the plant, or may be fed into storage hoppers for bagging and loading vehicles. Chutes are arranged so that large coke may also be taken by elevator to a breaker for the production of small coke, the broken material passing back for re-screening.

Household small coke is all taken by belt from the primary screens to a large storage hopper. It is released from this hopper as required on to another belt, which takes it to two 1-cwt. automatic weighing machines for bagging; but first it is passed over a "Gyrex" de-dusting screen to separate breeze and dust which have been formed by attrition in the storage hopper. By this re-screening process the consumer is assured of receiving an accurately graded coke. The breeze and dust are returned to mix with the breeze and dust from the four primary screens.

Provision is made for loading household small coke into vehicles, and an additional ½-cwt. automatic weigher has been installed for small sales to consumers collecting their own coke.

Industrial Coke.

The grades included in the term industrial are large coke, small coke, and breeze, the latter being a mixture of both household and industrial material.

Industrial large coke may be loaded directly into trucks

or taken to storage hoppers. On withdrawal from storage it is passed over a de-breezing screen before loading into vehicles. Large coke may also be taken by elevator to a breaker to form small coke, but, in addition, there is another breaker in which the broken small coke may be still further reduced to breeze. Alternatively, small coke from the primary screens may be passed directly to the second breaker for the production of breeze. With this arrangement of breakers it is possible to satisfy practically any demand for small coke or breeze which is likely to occur.

Industrial small coke from the primary screens is taken by belt into storage hoppers, where distribution is effected by a shuttle belt. Coke is removed from storage by belts for loading of vehicles and railway trucks; this coke is also re-screened before sale.

The material through 1⅛ in. from the four primary screens goes by belt conveyor to either of two "Gyrex" double-decker de-dusting screens of ½ in. and ⅜ in. mesh. The dust (below ⅜ in.) falls into the dust hopper directly below, and the two sizes of breeze mix again before passing on to the next process.

It may be mentioned here that a double-decker screen is used for de-dusting, as it effects a more efficient elimination of dust from material up to 1⅛ in. than a single-decker screen; less work, therefore, is thrown on to the subsequent pneumatic cleaning plant and dust filter. The use of a double-decker screen also provides a useful by-pass for the pneumatic cleaning plant, as the two sizes of breeze may be led, before mixing, directly to hoppers.

Dry-Cleaning.

The whole of the breeze on the plant is subjected to a dry-cleaning process before sale, and in addition a portion of the breeze for certain purposes is also washed. Dry-cleaning is confined to breeze, as most of the bats are to be found in the smaller grades.

The dust-free breeze, which is now ⅜ in.-1⅛ in. in size, goes by either of two elevators into small hoppers, from which it is fed on to either of two "Birtley" pneumatic separators. Bats are separated from the coke and go by chute to a hopper, from which they are removed to tip. "Middlings"—that is, the portion between clean coke and bats—are returned to the elevator boot for re-separation.

The cleaned material from the separators passes down chutes on to either of two "Gyrex" double-decker screens of ½ in. and ⅜ in. mesh separating:

(*a*) 1⅛ in.-½ in. inch breeze.
(*b*) ½ in.-⅜ in. bean breeze.

Inch breeze is taken by belt into either of two storage hoppers, and bean breeze falls into a hopper below.

A small quantity of material passes through the ⅜ in. mesh which is termed "pea breeze." This is taken to a separate hopper and passed over a final de-dusting screen of ¼ in. mesh before sale.

Chutes are arranged so that both sizes of breeze may be passed on to either of two rotary washers and thence to special washed breeze hoppers.

Although the coke is very much improved by dry cleaning, the further process of washing eliminates any small traces of batty material that may have escaped the dry cleaning plant; this is important for obtaining a clean weld. Some customers prefer washed material, as dry coke is not suitable for their work and they find difficulty in wetting it uniformly themselves.

Screened coke, when stored in hoppers, suffers a certain amount of disintegration, which results in the formation of some material of smaller size. It is important that this material should be eliminated from the final product in order that the consumer receives the exact grades advertised.

At Windsor Street all grades of coke and breeze drawn from storage are passed over final de-breezing screens before delivery to the consumer. In the case of the larger sizes of coke, these consist of static screens, while for the various sizes of breeze and washed breeze small high-speed vibratory screens are used. The dust and breeze from these screens fall on to a common conveyor belt running past all loading chutes, whence it is taken by elevator to mix with the breeze and dust from the four primary screens.

Dust is taken by belt to canal boats and is sold as a fuel for boilers, particularly where chain grates are used. Mixed with slack it makes a good fuel, and there is a sale for all dust removed from the plant.

It is not the practice to put unscreened coke to stock because of the danger of fires. Fires have been found almost invariably to commence from the segregation of dust, as the dust from vertical retorts contains a relatively higher proportion of volatile matter and occasionally uncarbonized coal.

Screened coke in the storage hoppers can be run out into skips exactly similar to those in use in the retort house; these may be picked up by the overhead cranes and emptied at any point on the stocking ground.

Stocked coke is picked up by grab and re-screened before sale.

The majority of the bats present in the coke are small and are to be found in the breeze. Bats are rarely found in the small coke—a fact which may be due to the improved cleaning of coals during the past few years.

Breeze is used for certain industrial processes which are adversely affected by the presence of bats, and as the industrial market is a considerable one, a dry cleaning plant was installed to improve the breeze from this point of view. The larger size of breeze or 1 in. nuts is also used extensively for enclosed domestic hot water boilers where slow combustion is required at times and bats are a hindrance.

During the last twelve months a considerable quantity of bats were removed by the dry cleaning plant and sent to tip; these bats would have provided a fruitful source of complaint from consumers if they had been sold with the breeze.

The Birtley Process.

The material is made to pass across a perforated and vibrating deck on which is provided a V-shaped plough whose point is nearest the feed end. A forced draught of air rising through the perforations is almost sufficient to lift the coke. The deck on either side of the plough is provided with a number of low barriers or riffles, and the coke is just able to float over the barriers, but the bats, being heavier, cannot quite rise like the coke. The combined action of the plough and the vibration of the deck forces the coke to the sides, where it falls off the deck into chutes.

The barriers or riffles which hold back the bats are fixed diagonally and run towards the plough, but do not quite reach it. Thus the bats are guided first inwards towards the plough and then along the plough to the far corners of the table, where they are discharged into separate chutes.

Actually in practice a portion of the treated products is taken from between the pure coke, and the bats are returned to the feed for re-treatment. This portion is known as "middlings" and contains both bats and pure coke.

The Birtley dry cleaning table consists of a perforated deck, beneath which is fixed an air chamber connected by suitable ducting to a fan. The air chamber in turn rests on knife edged rocking plates supported on a bed frame. The air chamber and deck receive an oscillating motion imparted by an eccentric drive situated at one end of the machine.

The inclination of the deck can be adjusted to suit conditions after installation in order that material may travel at the correct speed for efficient cleaning. The air pressure, usually maintained at 2½ in.-4 in. water gauge, is provided by a fan capable of delivering 20,000 cu.ft. of air per minute at a maximum pressure of 7 in. water gauge. The fan is driven by a motor of 40 h.p., and it is interesting to note that, of the total power required to operate a cleaning table, approximately 90% is utilized for supplying air.

The machine is covered by a hood in which is fixed an outlet for air that is passed through the deck. Dust-laden air is returned to a large filter and circulated back to the fan in clean condition. A steady and evenly distributed supply of material is important for the efficient operation of the machine, because the air pressure is so regulated as to float a definite weight of coke on the deck.

The working of the table is influenced by the presence of small pieces of batty material which are light enough to be floated and passed along with the clean coke. If pieces of coke saturated with water go on to the table along with the dry material they will pass out with the bats, as such pieces are too heavy to be floated by the air streams; this indicates the importance of even quenching of coke which is to be dry cleaned.

The dry cleaning plant has been successful in providing a considerably improved breeze, demonstrated by the fact that since its installation complaints due to batty material in breeze have been practically *nil*.

Use of Wear-Resisting Materials.

The rapidity with which coke wears out mild steel has made it necessary to search for materials which would give a longer life and effect a corresponding reduction in repairs. The materials which are in use or have been tried

on the plant are cast iron, glass, rubbered plate, brick, and concrete.

Cast iron is used largely as a lining for chutes, particularly at those points where coke is discharged with a velocity into the chute, as, for example, from a belt conveyor. Plates are cast in small sections $\frac{3}{8}$ in. thick which can be conveniently handled and which allow a worn plate to be changed without disturbing the remainder in the chute. The width is so chosen that multiples of these small plates fit any chute. The lowest plate in the chute is fixed and acts as a support for those above, which are laid flat and held down by their own weight. The sides of chutes are also partially protected by similar plates.

Cast iron plates are particularly suitable for chutes which have only a small inclination, as the surface wears smooth and permits the coke to slide with freedom.

The cost of cast iron plate is a little more than mild steel plate of the same thickness, but the life is at least three times as long. Economies, therefore, result from the use of cast iron.

As a wear-resisting material, glass did not prove the success which might be expected in view of its extreme hardness. It was tried as a lining for chutes, but after a few days the glaze was removed by abrasion and the exposed matt surface wore more quickly than cast iron.

A material which is used with success for certain purposes is rubber mounted on steel plates. Rubber wears longer than cast iron and in addition reduces breakage to a minimum. Rubbered plate is composed of a layer of good quality rubber $\frac{3}{8}$ in. thick adhered to $\frac{1}{8}$ in. steel plate and made for our purposes in strips so that multiples suit any chute as before. It is used mainly for lining the side plates of chutes or the bottom plates where there is a fairly steep inclination on the chute. The strips are cut to the required lengths and laid side by side in the chute; they can then be interchanged or removed when uneven wear occurs.

The elasticity of rubber causes the coke to rebound to some extent, particularly when the flow is small; some form of steadying device or a light cover over the chute is therefore desirable.

An excellent use has been found for rubbered plate as a lining for the side plates of the "Gyrex" screens. The life of the side plates is considerably increased, and, moreover, coke which comes in contact with the rubber is rebounded into the screening zone. The light weight of the rubber does not appreciably add to the weight of moving parts in the screen.

The cost of rubbered plate is approximately three times the cost of cast iron, but it has a life which is more than three times that of cast iron.

Blue brick tiles 9 in. by $4\frac{1}{2}$ in. by $1\frac{1}{2}$ in. are used for lining the sloping surfaces of concrete hoppers, and a 2 in. layer of concrete is laid in a large steel storage hopper. Both these materials are satisfactory and have a life of many years.

Anti-Breakage Devices.

It is desirable that in the transportation and storage of screened coke breakage should be reduced to a minimum. If breakage is appreciable, the material drawn from hoppers for consumers' use will not be of correct grade unless it is passed over final de-breezing screens, as at Windsor Street. In addition, a certain amount of dust is produced which sells at a much lower price.

A common cause of breakage is the impact of coke falling into a deep hopper, a difficulty which has to some extent been overcome by:

(*a*) Reduction of speed in chutes.

(*b*) Elimination of direct fall of material into hoppers.

(*c*) Maintaining the hoppers as full as possible.

When coke is released through a door in the base of a hopper and more coke moves to take its place, attrition occurs at the mouth of the hopper, which increases according to the depth of material. If coke can be drawn mainly from the surface, attrition, with its consequent dust formation, is reduced to a minimum, and this desirable result may be obtained by the use of special towers, such as are fitted inside the hoppers at Windsor Street.

A tower 2 ft. square in cross section with apertures in all the sides is fixed vertically over each outlet door in the base of the hoppers. It is constructed of four vertical corner members of angle iron joined by horizontal strips of cast iron, with spaces between adjacent strips through which the coke may run.

The tower tends to restrain the mass of coke in the hopper, so that when the door is opened a column of coke descends inside the tower and is replaced by coke entering through the spaces in the tower mainly from the upper layers in the hopper where the crushing effect is least.

Discussion.

The PRESIDENT congratulated the Author upon his lucid description of a complete modern plant for the handling of coke. Referring to the description of the Birtley dry cleaning process, he said he had recently seen such a plant at work and was impressed by the way in which the coke was separated from the bats, the vibrating screen, together with the air blast separating the two materials as though they were liquids of different specific gravity. The effect of the price of coke on works costs and the price of gas was important and was a point often overlooked.

Mr. E. T. PICKERING (Birmingham), in proposing a vote of thanks to Mr. Scott, referred to the number of domestic coke grates in use and the steps that were being taken in Birmingham to develop this market. He would like to stress the fact that it was the most sensitive market the Industry had; it was extremely sensitive to variations in quality, and for this reason it was necessary to see that the coke supplied was of uniform quality. The proper mixing of coals had an important bearing on the problem of producing a uniform coke, while the segregation of the cokes which were most suitable for domestic use, as described by Mr. Scott, was an important factor. Referring to the possible future competition from low-temperature and medium-temperature coke oven products, he said that while at the moment the danger might not be very great, competition from these sources might well become intensive, and, therefore, every attention should be paid to the production of a coke suitable for use in the ordinary domestic grate.

Mr. A. W. ATTWOOD (Coventry), who seconded the vote of thanks, said it was necessary to have a market for coke, and in order to ensure this the consumers must be satisfied; otherwise they would resort to other forms of fuel, and gas undertakings would be left with the coke on their hands. At Coventry, during the two years they had been pushing the sale of coke grates, they had sold over 600. He asked if the screens were under cover or open to the atmosphere. At Coventry they had found that covered screens lasted twice as long as those in the open.

The Milbourne Medal.

At this point in the meeting, the PRESIDENT—in the absence of Mr. R. J. Milbourne—presented the "Milbourne" Medal to Mr. F. J. Bengough (Birmingham), awarded him for his Paper read during the previous session.

Mr. S. K. HAWTHORN (Birmingham) said that the technique of coke treatment had advanced by leaps and bounds during the past few years; the Windsor Street plant was one of the most up-to-date in the country, and was a plant of which the Engineer—Mr. G. C. Pearson—was justly proud. With regard to domestic coke, he agreed that ease of ignition and correct sizing were of extreme importance, and the former could be easily destroyed by over-baking in the retorts. This occurred occasionally at Bank Holiday times when the retorts had been standing for two or three shifts. There was no doubt that for the first 16 hours after re-starting, the coke was definitely less ignitable than the normal coke, and if this coke were sent out to domestic consumers, it might easily bring complaints. In consequence, at Windsor Street this coke was diverted to the industrial side of the plant for the first critical hours. He suggested that on a small works where one retort was a comparatively large proportion of the plant, the coke discharged from the retort immediately after scaling should not be sent to domestic consumers. He pointed out that any grade of coke could be sent to the producers at Windsor Street, which was a big advantage with the varying demands for different grades of coke. No unscreened coke was available at Windsor Street, and no dissatisfaction could arise through re-sale by merchants.

Mr. F. H. BATE (Birmingham) asked Mr. Scott to say a few words about some work on controlling moisture content at Windsor Street; the moisture content had a marked effect on ignitability.

Mr. T. F. E. RHEAD (Birmingham) pointed out that when a special household fuel was produced, it was important that a continuous supply was ensured.

Mr. H. G. BROADBRIDGE (Leamington) said it was an interesting fact that in his town before they had the grading plant they sold 55% of the coke made in the town. Last month, after the plant had been working for about twelve months, they were selling about 90% of their coke in the town. When they started their No. 1 size, over $1\frac{3}{4}$ in. was 41% of the sales; this had fallen to 30%. No. 3 size, over $\frac{1}{8}$ in. and under $1\frac{1}{4}$ in., had gone up from 14% to about 40%.

Mr. A. V. NORTH (Dudley) commended the foresight of Birmingham in spending such a lot of capital in laying down this plant. At Dudley about eighteen months ago they installed a plant, not such an elaborate one but sufficient for their requirements, and they had found definitely that grading did pay. It might mean the expenditure of capital, but it also meant an increased demand for graded fuel.

The Author's Reply.

Mr. D. W. G. SCOTT, in reply to the discussion, agreed with Mr. Jenkins that in the Birtley process the coke seemed to be a floating undulating mass and was able to pass over the riffles on the deck, while the heavier bats were detained and forced to the end of the table.

The mixing of coals required a considerable outlay, whereas at Windsor Street Works they could put Nottinghamshire and Derbyshire coals on certain ranges without additional expense; apart from modifying the screening plant, the production of household coke by this method was carried out at small cost.

The main screens were under cover, and there was also a hood over them so that the dust extraction plant could take away the dust rising from the screens. Tough steel meshing had not shown any superiority over ordinary steel, but he could say that the welded meshing had worked satisfactorily.

As Mr. Hawthorn mentioned, any grade of coke could be taken to the producers, and it was a very useful outlet should they have a larger stock of any particular grade than they required. He agreed that over-baking was bad; but at Windsor Street no trouble was experienced from this cause, as high throughputs were maintained.

In reference to the control of moisture content, they had installed a type of spray in the bottom castings of the retorts, which gave a highly atomized jet and resulted in more even quenching. Previously the sprays had been apt to wet portions of the coke too much, and sometimes pieces of coke saturated with water were removed with the bats in the Birtley plant and so caused waste. Blue brick linings had been used for producer chutes in the retort house with success, but the great advantage of cast iron and rubber plates was that they were easily interchanged or replaced and had good wearing properties.

The automatic machines were scaled down to ½ cwt., but there were also ordinary scales which weighed any quantity.

The Care and Maintenance of Waste-Heat Boilers

by
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A Paper read before the Scottish Junior Gas Association (Western District) at a meeting held at the Royal Technical College, Glasgow, on Saturday, Nov. 14.

Waste-heat recovery may well be taken to illustrate the progress of research and development in the Gas Industry, in but one of its activities, during the past several years.

This, coupled with the development of breeze burning in producers has created a means of obtaining marked increased carbonizing efficiency, and hence of lowering production costs at a time when it is most needed to meet the higher coal prices with which the Gas Engineer is now faced.

To-day, resulting from the continued improvements which have been made, both in design and application of waste-heat recovery equipment, it is now normal practice to recover as much as 50% of the potential heat value of the coke fed to the producers. This heat is retrieved in the form of superheated steam available for the carbonizing process and general works purposes.

Having regard to the importance of this subject, therefore, the object of this Paper is to suggest some practical points whereby this efficiency may be maintained.

Waste-heat boilers in connection with carbonizing plant have five main advantages:

(1) Fuel economy.
(2) Economy in labour.
(3) The provision of a cheap steam supply.
(4) Steady hour to hour production of steam.
(5) Positive setting draught where induced draught boilers are installed.

Because of these advantages waste-heat recovery is recognized as an essential feature of the carbonizing plant.

Design.

Careful study has been devoted to the design of waste-heat boilers with the object of combining highest efficiency with simplicity of construction and operation.

Long study has been given particularly to the correct size of boiler, which is an all-important factor in relation to the efficiency of the boiler according to the amount of heat available from the setting. A boiler of inadequate dimensions will suffer from the serious troubles of overloading, while too large a boiler is less efficient in operation and entails the possibility of acid formation due to reducing the temperature of the exit gases too low. Correctly proportioned steam and water capacity is necessary to prevent sudden fluctuation in steam pressure and in the water level. Equally essential is a sufficiently large water surface for the disengagement of the steam from the water at a sufficiently low rate to obviate foaming.

Having decided this, the boiler is arranged as near as possible to the waste gas exit from the setting in order to transmit the waste gases to the boiler with the minimum temperature reduction and particularly of air infiltration, the detrimental effect of which cannot be too strongly emphasized.

In their passage from the setting to the boiler, no restriction must be placed upon the flow of the waste gases, or otherwise undue load will be thrown upon the fan, and it is possible, which is more serious, that the heating of the setting may be disturbed.

The design of the boiler itself, and I propose to deal with the type manufactured by Messrs. Spencer-Bonecourt, is based upon the principle of splitting up the waste gases into a large number of small diameter tubes in which the waste gases travel above the critical velocity which determines what is known as "turbulent flow." This principle is essential in waste heat recovery, because heat transfer by contact is much more effective than that by radiation from gases at relatively low temperatures.

Without going into the technique of the flow of gases through pipes and its influence upon heat transfer from hot gases to the walls of the pipe, it is sufficient to say that above a certain critical velocity the conditions are such that every molecule in the gases comes into actual contact with the walls of a straight pipe, and this condition is not appreciably improved or even affected by changes of direction or the interposition of baffles or other obstructions within the pipe. On the other hand, it is very seriously impaired by the presence of deposits within the pipe, which comes between the walls of the pipe and molecules of the gases. It follows, therefore, that easy and positive tube cleaning is of paramount importance to maintain the high efficiency of boilers designed on this principle.

The fan of the induced draught boiler may be driven by either steam turbine, reciprocating steam engine, electric motor, or a combination of steam and electric drive, one acting as standby.

Of these, the steam drive is to be preferred on account of the heat interchange obtainable from the exhaust steam, and because it is less liable to failure than the electric motor, whether through interrupted supply or other cause.

In every case, waste-heat boilers are fitted with automatic feed water regulators and alarms, which have reached a high standard of dependability.

Pumps, water heaters, water storage tanks, &c., are nested as near to the boiler as possible to minimize loss by radiation, and to provide easy inspection and accessibility.

Ample platforms with easy stairways or ladders are essential for convenient and ready access to lubricating points, valves, and gauges as well as to damper boxes.

Natural Draught Boilers.

As the name implies, this type of boiler is operated by chimney pull instead of by induced draught. Natural draught boilers are usually placed vertically to minimize the amount of pull to operate them and to save space, but they can also be of the horizontal type, with the possible advantage that, in cases where increased steaming capacity is ultimately anticipated, provision can be left for induced draught to be later incorporated.

Dealing with the vertical natural draught type, the boiler is arranged adjacent to the chimney on the same seating to reduce heat losses and to facilitate the damper arrangement.

The waste gases enter at the base of the boiler and after passing through the fire tubes are returned back into the chimney at the top of the boiler. The gases travel through this type of boiler at a much lower speed than is the case with the induced draught boiler, and therefore with about 30% lower steam production per pound of waste gas.

The natural draught boiler, however, is eminently suitable for the smaller works, since there is no mechanical unit to maintain, and in normal instances it will provide sufficient steam for the entire works requirements.

The tubes within the boiler are of the straight bore pat-

PERTH CORPORATION GAS DEPARTMENT.

WASTE HEAT BOILER REPORT—24 Hours ending 6 a.m. ..... day ..... 193....

	Waste Gas Temp. °C.	Draught			Turbine.			Boiler Steam Press. Lbs./0"	Super Heater Temp. °F.	Gauge Glasses Tried.	Blow Down Valve Operated	
		Gauge 10th in.	Boiler Inlet. 10th in.	Boiler Outlet. 10th in.	Oil Gauge. Lbs./0"	Steam Press. Lbs./0"	Exhaust Steam. Lbs./0"					
7 A.M.												
8 ..												
9 ..												

Fig. 1.

tern arranged in parallel lines for easy external cleaning, expanded and beaded over at the inlet end and expanded and bell-mouthed at the other.

Tube cleaning is carried out from a platform at the top of the boiler through small detachable plugs, so that the draught is unaffected while this operation is in progress. This, therefore, means that the boiler can work continuously with maintained efficiency except for the annual inspection and cleaning period.

Adequate dampers allow for either the whole of the waste gases to pass through the boiler, or if excess steam is available, a portion of the heat can be bypassed to the chimney to suit the requirements.

The complete range of mountings are fitted to the boiler so that easy access to them can be made from elevated platforms.

There are two important points to be observed in respect of the internal condition of this boiler.

(1) Scum at the steam-water level must not be allowed to adhere to the tubes.

(2) The prevention of scale formation on the bottom tube plate or lower portion of the tubes, where the gases are at their maximum temperature. If scale is allowed to form here and to harden, leakage may ensue.

Both difficulties can be obviated either by suitable water treatment, periodical blowing down determined by trial, or by a light continuous blow down.

Maintenance.

It is quite as important, in my opinion, to see that a definite output of steam is being produced by waste heat, according to the conditions, as to expect a certain gas or coke yield per ton of coal carbonized.

A daily log incorporating the salient conditions and gauge readings should be kept. This acts as an immediate check on what is happening within the boiler, instead of waiting, probably for months, to discover some cause of inefficiency which might have been corrected earlier. A typical page of such a book, which is in use at the works of the Perth Gas Department, is here reproduced and shows the details noted each shift (fig. 1).

In conjunction with these details a note should also be made of the amount and class of fuel consumed in the works boilers, and it is desirable to commence the record of these details when the equipment is new or well cleaned so as to form the best basis for comparison.

A water meter is invaluable on the supply line to the boiler. Alternatively, a simple form of counter may be attached to the pump, which can be calibrated at the rate of so many strokes per 1,000 gallons, and for most practical purposes the information thus obtained is sufficiently correct to denote the comparative performance.

Tube Cleaning.

Upon this important operation depends, more than anything else, the ability to maintain maximum boiler efficiency. It is insufficient merely to push a brush through the tubes and declare them clean. In all probability they are not, due to the heat softening and curling the wires of the brush, thus reducing its diameter, with the result that only the lower portion of the tube is cleaned.

Fig. 2.

Experiments have been made with all types of brushes and scrapers to find one which will leave the internal surfaces of the tube metal clean. The most effective method, in my opinion, is the use of a spring scraper (fig. 2).

The scraping surface is on the return side, so that the dislodged dust is pulled to the exit end. By reason of its springlike construction, pressure is continually exerted on the whole internal surface of the tube, with the assurance, therefore, of all dust being removed. Make certain, by suitably marking the cleaner, that the scraper passes through the entire length of the tube. All the tubes should be cleaned once a week, and if it can be arranged to scavenge half the tubes on, say, Tuesday and the other half on Friday, a steadier output of steam is maintained. This will be clearly shown by the thermometer at the exit end, which should record an average reading of 220° to 230° C.

To clean the tubes externally, a scraper, illustrated in fig. 3, passed sharply between the tubes, horizontally and vertically, will remove deposits of adhering scale. Before putting the boiler to work, however, it is advisable to spray the external surfaces with a coating of "Apexia" or "Cementwash," upon which the scale will form and be more easily removed. Care should be taken to remove all deposit of scale which may have formed upon the inlet tubeplate to avoid overheating the metal. In instances where a standby boiler remains idle for some part of the year, it should be washed out, dried, and left empty until required for use.

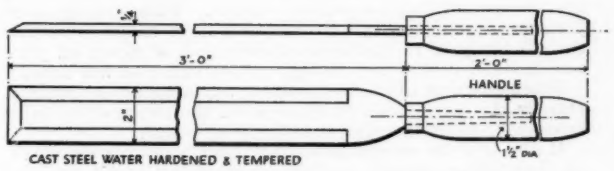

Fig. 3.

Flues and Brickwork.

Next in importance to tube cleaning, I would place tightness of flue brickwork. Evaporation can be reduced as much as 25% by air infiltration. Periodical inspection should, therefore, be made of the brickwork in conjunction with analyses of flue gases, and cracks, however small, pointed up.

Flues are invariably steel encased and the thickness of the interior brickwork should not be less than 3 in. of insulation and 3 in. of firebrick, with the firebrick inside. This brickwork must be very carefully built with correct allowances for expansion and fine joints to reduce the possibility of cracking and hence air infiltration.

The connections between the setting brickwork and the flue are points worthy of periodical examination, as leakage is often discovered here. Dampers of settings or flues not in commission must be well sealed and occasionally inspected.

Analyses taken at various points along the flue and at the inlet to boiler will enable leakages to be located. After they are made good, and should there still be an indication of excess air, a check might be made of the setting to ascertain that the producer gas nostrils are not becoming furred up and hence admitting a decreased proportion of CO, or that the air slides are not too far open. Excess

air can also be sometimes traced to dirty producers. A CO_2 recorder provides an invaluable check on the gases entering the boiler.

Superheaters.

The superheater is usually placed in the inlet products box, but out of the direct flow of the waste gases. It should be of the single flow type, the tubes being of cold drawn weldless steel designed for easy withdrawal. The two headers, which are of steel and are of circular cross section for maximum strength, are rigidly stayed together to prevent vibration or movement, in a steel box with a readily detachable cover and insulated with thick asbestos packings.

With this type of superheater it is quite normal practice to attain a superheat 100° F. above the saturation temperature, but this figure obviously varies with such factors as temperature difference, gas to steam, and the velocity of the steam through the superheater. Superheaters of this design seldom require attention, but it is advisable at the annual cleaning to withdraw the elements for clearance of solid deposits which may form within them in course of time. When this is done, new copper jointing ferrules should be used. The safety valve on the headers is set at 15 lb. above working boiler pressure. When starting up, some steam from the works boiler should be passed back through the elements by means of the drain cocks, which must remain open until the boiler is in operation.

Turbines.

The steam turbine has much to commend itself as a drive for waste-heat boiler fans. It is perfectly balanced, and hence there is no vibration. Correct alignment, as with all other drives, is essential, and this should be periodically checked, say, once a year.

The design usually employed is of the single stage impulse type, the rotating element being actuated by the impact of steam passing through the blades at relatively high velocity.

The expansion of steam takes place in the stationary nozzles bored in the turbine case. Under certain conditions, and chiefly in the larger sizes, the nozzles are under the control of hand operated valves. This arrangement permits of some nozzles to be put out of commission and the efficiency of the machine maintained, working on pressure instead of volume, though not working at full load.

When starting up, a few minutes warming up is required. During this period the drain cock on the steam chest must be open to clear the system entirely of water.

If the turbine exhausts against back pressure all valves on the exhaust should be open to avoid full boiler pressure coming upon those parts designed only for exhaust pressure when the stop valve is opened.

Obviously, proper lubrication of the turbine is very important for long life. Prior to starting up, the oil should be checked for correct level. Once per week a quart of oil should be drained from the sump and replaced with fresh oil. The drained oil is afterwards quite suitable for machinery lubrication, such as conveyors and other handling plants. The oil for the turbine shafts and gears operates at about 5 lb. pressure and an hourly check should be made of the gauge to see the pressure does not fall below this. Only pure mineral oil should be used in the machine.

Sometimes it is noticed that a gradual falling off in efficiency of the turbine takes place just before annual cleaning time, particularly where boiler feed water is of poor quality. Investigation shows, in the majority of cases, that this is brought about by deposit formation in the nozzles, and it follows, under such circumstances, that the steam is impure.

A Tachometer fitted to the fan shaft is a valuable addition and forms a good guide as to whether " All's well " with that section of the equipment

Before leaving the subject of turbines, may I reiterate the importance of ensuring complete drainage of water from the steam supply before starting up, and that none is allowed to gather or to go forward to the turbine during operation. Otherwise, serious damage to the machine might result.

Induced Draught Fans.

There is very little about the fan requiring attention, the main point being to keep the blades clean so that its perfect balance is maintained. At annual cleaning time the inspection door should be removed to see everything is in order within the casing.

If the fan damper is not graduated it is advisable to do so, as it gives, in conjunction with the draught gauge, the operator a further check on the running conditions. Hourly checks should be made of the water cooled bearings to see that the flow of water is normal, and when the boiler is shut down the water side of the bearings must be looked at, and, if necessary, cleaned so that the temperature of the bearing is maintained sufficiently low for lubrication to be effective.

Boiler Feed Pumps.

" It pays to fit the best " is worth bearing in mind when installing boiler pumping equipment. There is nothing more embarrassing than having to dismantle and reassemble a pump, to correct some defect, while the water level is gradually disappearing from view in the boiler gauge glass. The maintenance charges on high quality pumps are negligible, and this, in addition to the trouble-free service they give, make them worth their cost.

The speed of vertical reciprocating pumps, as usually supplied with waste-heat boiler installations, is from 20 to 25 double strokes per minute, and in this connection it should be remembered that the slower the pump speed the longer the life.

When starting the pump, see that all the water is cleared from the system by opening whatever drain cocks there are and by operating the valve spindle up and down a few times with the special key provided.

Two pumps, one to act as standby to the other, are usually incorporated with each boiler unit, and it is good practice to run one for 5 days a week and the other for only 2 days, thus ensuring that both are in working trim. The latter pump is then in good condition when the former shows signs of wear.

In every case a head of water, however slight, is advantageous to the working of the pumps, and should the arrangement provide for passing hot water through them, the head should be increased as the temperature rises above, say, 180° F.

The exhaust steam can be very effectively passed through a steam coil in the water tank, and where this is done, provision must be made for the draining of condensates to obviate back pressure. Besides usefully interchanging the heat of the waste steam to the storage water, it overcomes the necessity of exhaust discharge to atmosphere, which often creates a greasy and unsightly patch on the surrounding brickwork.

Injectors.

It is essential that the water suction pipe be perfectly air-tight and free from grit and scale. The water supply may be either above or below the injector, but it is always preferable to place it as near the water supply as can be conveniently arranged.

A back pressure check valve must be placed on the delivery pipe, between the injector and the boiler, as well as a valve on the steam pipe, and a regulating valve on the water pipe.

The steam pipe should have an independent connection placed as high as possible on the boilers to ensure a constant supply of dry steam.

Feed Water Heaters.

The design of this unit usually takes the form of multiple copper pipes contained in a cast iron casing; the steam passes through the tubes and water round them, the main points of the design being ample area for heat interchange with an internal arrangement to produce minimum back pressure.

Apart from the question of fuel economy, feed heating is beneficial, as it reduces temperature variation within the boiler and thus reduces temperature strains. Also preheating the feed water facilitates the removal of gaseous impurities and reduces the risk of corrosion in the boiler.

The exhaust steam from the fan driving unit is sufficient, in the average case, to raise the temperature of the water from 60° to 180° F., but the exhaust from other works auxiliaries can also be directed through the heater.

It is desirable to derive maximum economy from this source, as the only expense is the initial cost of the equipment, and if we consider that the temperature rise mentioned above (*i.e.*, from 60° to 180° F.) means a 10% saving, it is evident that the steaming capacity of the boiler is substantially increased by preheating.

Feed Water Regulator Equipment and Water Alarms.

There are several standard designs of this equipment on the market. The writer has most experience of the " Thermofeed " type with " Hilo " water alarm. Briefly, the " Thermofeed " regulator consists of a float chamber connected to the steam and water spaces of the boiler by means of 1 in. bore pipes (with isolating valves), so that the water level in the float chamber is at the same height as that in the boiler. The float chamber contains the

mechanism consisting of ball float, toggle movement, &c., and its duty is to operate either a control valve in the steam supply pipe leading from the boiler to the feed pump or a control valve fitted in the water delivery pipe to the boiler. When sufficient water has been delivered into the boiler, the "Thermofeed" regulator comes into action and causes the control valve to close by means of steam pressure. When the water level falls in the boiler, the steam pressure on the control valve is released and it automatically opens. By this means the water level in a waste-heat boiler can be maintained at its proper height with a variation of approximately ¼ in.

Some form of water alarm is also a necessity. Its purpose is to sound an alarm by means of a steam whistle or bell in case of feed water shortage caused, for example, by the breakdown of the boiler feed pump. The "Hilo" alarm is connected to the boiler in the same way as is the "Thermofeed" regulator. Its float chamber contains a ball float which slides over a centre spindle, and toggles and pawls to actuate a small steam valve at the base of the alarm whistle which sounds when the water level rises or falls by more than a predetermined amount.

The whole of this equipment requires only very little attention, but it is advisable periodically to make use of the blowdown valves provided in order to prevent the accumulation of sludge or sediment in the float chambers, and it is suggested that this operation be done weekly.

Every six months the "Thermofeed" and "Hilo" alarm instruments should be isolated by the valves provided, and the internal parts of each examined and cleaned if necessary. At this time their connection from the boiler must be blown through to ensure that no restriction by deposits is taking place.

When starting the boiler the instruments should be primed with water, and both steam and water valves connecting to the boiler should be left open so that no undue strains are thrown upon the working parts by suddenly opening to full boiler pressure.

Water Gauges.

It is essential for safe boiler plant operation that the operator pay attention to water columns and gauge glasses. The operator on each shift should blow down the water gauge glasses as one of his first duties. Water gauge cocks should be operated individually and not together to permit separate observation of the action of the water within the glass. Blowing down will remove loose sediment which in time may accumulate and obstruct the connection which might result in a false water level being shown.

Feed Water Treatment.

The problems in regard to the proper treatment of water for boiler feed purposes are many and varied, and as a considerable amount depends upon good quality feed water for continued efficiency and long life of the boiler, close attention should be paid to it from the time the boiler is put into operation until correct conditioning has been obtained.

Care of the feed water is a most important branch of boiler maintenance. When a new installation of waste-heat boilers is contemplated the intended feed-water should be analyzed. Boilers such as we are dealing with will accommodate comfortably water with a hardness not less than 2° or more than 5°, but outside these limits some treatment will be required. It is not generally a good thing to treat water in a boiler, though in a small installation this cannot be avoided. But whether the water is treated internally or in a separate plant, it should always be remembered that if the water is changed, the treatment must be changed also. The necessity for periodical analyses and general supervision of the water supply is obvious. In any case, quack remedies should be avoided, and if the water is in any way abnormal, the boiler maker or other competent specialist should be consulted.

A suggestion which the writer has found to be of great assistance in the endeavour to prevent scale formation, or to arrest it at an early stage, is to shut the boiler down for an internal inspection at the end of three, six, and twelve months during the first year of operation in order to ascertain whether the feed water requires modified treatment. Thus immediate detection of scale formation or tendency to corrosion is effected.

Scale and Efficiency.

The existence of scale in boilers has for many years been accepted as a necessary evil, but this viewpoint has been rapidly changed by considerations of modern boiler design, by increased operating pressures, and rates of heat transmission. It has been estimated that a calcium sulphate scale of ⅛ in. in thickness can account for a heat loss of about 14%. Much depends, of course, upon the nature of the scale, but there is a definite increase of evaporation to be obtained by the elimination of scale on the internal surfaces.

Boiler scales vary widely in their characteristics. Some are hard, close grained, and non-porous. Others are comparatively soft, light, and porous, the crystal structure being badly defined. In general, sulphate scales are hard and non-porous. Carbonate scales are usually soft and porous.

Only correct water treatment will obviate scale formation. In cases where it is found that boilers are already coated with hard scale difficult to remove, it will be found that the addition of caustic soda, and steaming for some hours before cleaning, will greatly facilitate the operation by softening and loosening the scale.

If water is salt or acid galvanic action may take place, which can be prevented by placing a piece of metallic zinc in the boiler, but the judicious use of lime is also advantageous.

Hardness of water is classified permanent or temporary relative to the bicarbonate of lime and magnesia which cease to be soluble at 212° F., or to sulphate of lime which remains in solution at much higher temperatures, the degree of hardness being dependent upon the nature of the geological formation from which the water is derived.

Generally speaking, the removal of both these forms of hardness is done either by filtration over zeolites or by treatment with caustic lime and caustic soda.

The former may briefly be described as the use of one of a number of preparations, or permutits, which are artificially produced silicates, capable of exchanging their basic constituents when placed in certain solutions, so that when employed for softening water an exchange takes place, the soda of the preparation, or permutit, passing into the water and being replaced by the lime and magnesia (the hardening constituents) of the water. On the other hand, in caustic lime or caustic soda treatment, lime sulphate is converted by carbonate of soda into the monocarbonate of lime, while sulphate of soda remains in solution as a very soluble salt. Broadly, these two lime salts or the magnesia are the only salts calling for practical treatment. Caustic soda is usually procurable at a cheap rate, and where both impurities are present it may be used and will perform a double duty and take the place of some or all of the caustic lime.

Perhaps the most important question in deciding the correct feed water treatment is: "Does the water remain constant, or does it vary with seasons, local industrial conditions, &c.?"

Corrosion, for instance, may be experienced from the following types of water, the impurities in which must be counteracted by suitable treatment.

Moorland Waters occasionally contain organic acids from peat.

Mining District Waters are usually acidic, and in some instances sulphuric acid may actually be formed with highly corrosive effects to the water feed pipes and boiler. Feed waters from such districts are most liable to changes and require careful examination from time to time to ensure that no important differences have occurred.

Tidal River Waters.—The presence of magnesium compounds and chlorides are nearly always found in these waters.

Condensed Waters are usually found to be highly oxygenated and may be acid, due to carbon-dioxide or carbonic acid in solution.

From the above, which are only a few illustrations of water impurity, it will be readily appreciated that correct treatment is imperative.

Causes of Priming.

Priming, denoting that water is coming over with the steam, is not often encountered in waste-heat boilers working in conjunction with continuous carbonizing plant, since the conditions on both plant and boiler are normally constant. Owing, however, to the damage which can be caused by priming indications, it should be looked for and guarded against.

There are several main causes, and they may be classified as follows:

(1) Overloading the boiler by sudden variations of steam discharge or by operating the boiler beyond its capacity, causing too quick steam release.

(2) Insufficient water surface and steam space in the boiler itself. This is a point which illustrates the significance of the correct size of boiler.

(3) Sudden change in water level, such as too violent "blowing off."

(4) Excessive specific gravity of the water within the boiler.

Indications of priming can be traced by examination

of the steam outlet pipe for sludge, the quantity found being usually relative to the amount of priming taking place. Water trickling back down the water gauge glasses is another pointer to priming.

Concentrated boiler waters will give rise to this trouble, the cause of the concentration being the accumulation of soluble salts within the boiler itself incidental to the evaporation of the water.

As the water evaporates, so are the soluble salts as well as matter in suspension left behind in the boiler. Hence, careful observation should be made periodically to ensure that the density is not increasing, but if it should be, steps must be taken to reduce it. If allowed to continue, trouble will be caused by superheater tubes becoming choked with deposits, damage to engines, and under certain conditions steam delivery pipes may actually choke up.

To overcome the difficulty of concentration, experiments should be made by blowing the boiler down more frequently or, alternatively, introducing a continuous blow down, which, incidentally, can be often accomplished inexpensively.

If too small steam space is suspected, conditions can be improved by lowering the water level of the boiler.

In one instance, which will serve as an actual illustration, a boiler was being blown down 2 in. each day, and even with this the specific gravity of the water within the boiler remained at 2½° Twaddel, and there was a tendency to prime at this density. More frequent blowing off was tried, and the final decision was to blow off each four hours, thus effecting a reduction of the specific gravity to below 2° Twaddel, which entirely obviated any further suspicion of priming.

Conclusion.

In conclusion, I would say that no attempt has been made to give tabulated figures of results. We are aware that carbonizing conditions vary widely, and I have, therefore, preferred to utilize that space to record, as fully as possible, the details which make for improved efficiency.

The figure of most importance is the evaporation obtained per pound of producer fuel. Herein lies the complete answer as to whether the waste heat boiler equipment is up to its standard of efficiency.

As standard check figures, it may be taken that, with the plant in normal working order, in an induced draught boiler, the evaporation should be 5·1 lb. of steam per lb. of coke fed to producers, and from a natural draught boiler 3·3 lb. of steam. Both these figures are on the basis of " from and at 212° F.," and when operating in conjunction with continuous vertical retorts.

The value of waste-heat recovery to the Gas Engineer is a figure which will vary considerably, according to the many conditions which govern it. Mr. Jamieson, of Johnstone, in his interesting Paper presented to the North British Association of Gas Managers in 1934, sets out his own figures at Johnstone. He showed that the saving in labour and fuel by the introduction of a waste-heat boiler was 1·3 pence per 1,000 cu.ft. on the manufacturing costs.

Discussion.

Mr. WEBSTER (Port Glasgow) suggested that the term waste heat was a misnomer, and the term ought to be " surplus heat." He asked if by some arrangement a larger volume of the waste gas could be diverted through the lower tubes of the boiler in order to give more even heating to the water. Could Mr. Poulson recommend a reliable type of CO_2 recorder, as this instrument provided a reliable guide on the gases going forward? Copper pipes were essential when dealing with preheated water, and he had knowledge of where de-oxygenating plants had been installed to overcome corrosion. He enquired if Mr. Poulson could give any particulars of automatic blow down. Was superheated steam an advantage when steaming retorts?

Mr. MCLAREN (Newton on Ayr) congratulated Mr. Poulson on his comprehensive Paper, which contained such a vast amount of practical hints on the care of waste heat boilers. He enquired if the Author had any experience with the " Sinuflo " tube, and what effect the increased area of this tube had on the steam produced and the possibilities for the future. Could Mr. Poulson suggest any means for increasing the evaporation of the waste heat boilers at his works? Regarding waste heat boiler turbine blades, he had experienced no difficulty, but in the turbo compressor, situated 75 yards away, the blades required to be renewed every 4 years. Could he suggest means of obviating this? To reduce works cost his Company sunk an artesian well, and the only difficulty they had had with this water was the temporary, not the permanent, hardness.

Mr. DAVIES (Alexandria) asked if it was the usual practice to set the safety valve on the superheaters to 15 lb. per sq.in. above the works pressure. He was of the opinion that it was better to work the pumps alternately for a week, but agreed that the idea for working for 5 and 2 days alternately was a very good one.

Mr. GLEDHILL (Stirling) also referred to the practical nature of the Paper. At Stirling they used the spiral tube cleaner and had found it to be very efficient. He suggested that it was better for the feed pumps to have an auxiliary steam supply and not to depend on the waste heat boiler. Care must be taken to see that the carbon glands were renewed when the boiler was let down. These were easily scored by the carbon dust drawn in by the slight vacuum on the turbine spindle. At Stirling the cost of maintenance of their boiler worked out at 0·05d./100 lb. coal carbonized. He agreed that 10% economy could be effected through mechanical draught control. To prevent the slight corrosion taking place in the stays in the steam space, they had coated these with cement wash.

Mr. GREIG (Dawsholme) said that at Dawsholme they had experienced some vibration. They also had tube leakage at the tube plate end. Mr. Greig stated that the tubes in the boilers were about 18 ft. long, and asked if lengthening these would be an advantage. In their Sulzer boiler the diameter of the tubes was greater than on the waste heat boiler connected to the carbonizing plant.

Mr. STURROCK (Greenock) asked if Mr. Poulson considered it good practice to pass additional producer gas in order to augment the evaporation of the boiler when only 50% of the carbonizing plant was employed. The Author referred to a figure of 5·1 lb. of steam to 1 lb. of fuel, and he would like to know the inlet temperature of the waste gases in order to produce such an evaporation.

Mr. BATEMAN (Kilmarnock) asked how long the Author considered was a proper time for heating up the boiler from cold to working pressure, and whether he considered it advisable to run the boiler for 12 months at a time. They had experienced acidic water in Kilmarnock totally disintegrating a zinc block weighing 42 lb., placed within the boiler, and that pieces had choked the blow-off valve. They were now using a suitable feed water treatment which had obviated this defect.

Mr. MILNE (Greenock) mentioned circulators, and gave an instance where water of 6° hardness had been successfully treated. By so doing the cost of the treatment had been reduced from 4s. to a few pence per day. Previously scale had formed on the inlet end, but the introduction of the circulator had relieved this.

Mr. SMITH (Dumbarton) asked what difference there was between using the exhaust steam for heating the feed water as against delivering it to the retorts under back pressure. He thought that it was good practice to examine all steam valves once a year.

Mr. KIRK (Motherwell) referred to the waste heat boiler which they had recently installed in conjunction with their Wilson-Glasgow and Glover-West settings. He thought the arrangement was unique; and despite the fact that the gases were carried some 110 ft., they had had no trouble, and the result was being well maintained. They had tested the tube scraper referred to in the Paper, and experiments which had been conducted showed that an increase of 10% evaporation was obtained by the spring scraper over other types. The importance of air infiltration could not be too strongly emphasized, and in Motherwell a regular inspection was made. At Motherwell, town water was not too good, and as a result provision had been made to supply the boiler from four sources if necessary, and suitable feed water treatment was adopted. He thought the boiler could go 12 months before shutting down, and stated that they had treated the boiler with " Apexior."

The Author's Reply.

Mr. POULSON, replying to Mr. Webster, said that the design of the boiler was such that, proportionate to the water space, correct tube spacing ensured an even heat transfer into the water throughout the entire cross-section of the boiler. There were various makes of CO_2 recorders on the market which could be relied upon to give accurate service. Regarding the question of automatic blow down, a boiler evaporating 3,000 lb. of steam per hour would have blown off by the automatic blow down about 150 lb. of water per day, and in one specific instance tests of the water blown down showed 200 grains of solids, an alkalinity of 10·6, and a Twaddell below 1°. Referring to Mr. McLaren's question on " Sinuflo " tubes, he had no experience in the operation of this type of tube, but his personal preference was the straight tube for easy and definite tube cleaning. The soundness of the earlier theories relating to turbulent flow or molecular contact has been clearly demonstrated by passing high velocity gases coloured with bright small dust particles through glass tubes and noting the " flow " behaviour at different speeds and on the different temperature conditions. It was found that no amount of baffling or tube waving gave the continous molecular impact which was given by turbulent flow. Referring to the question of increasing the evaporation, he would suggest the use of the spring scraper referred to; and with regard to the turbo compressor blades requiring renewal every 4 years, this might be caused by water, and the introduction of a steam drier would do much to obviate the trouble.

Replying to the question of Mr. Davies, it was the usual practice to set the safety valve at 15 lb. above working pressure, and he had found it advantageous to operate the pumps, one for a longer period than the other. He agreed with Mr. Gledhill that it was advantageous to have an auxiliary steam supply to the pumps, and, in fact, it was beneficial to have the main steam lines of the waste heat boiler and works boilers connected together applying, if necessary, a surplus valve. In regard to corrosion, they had had on their stay tubes, the speaker was of the belief that they would entirely obviate this

by thoroughly cleaning down to the metal and well painting with "Apexior." Replying to Mr. Greig, Mr. Poulson said that the vibration mentioned might be caused by the fan having become unbalanced due to dust adhering to some of the blades. A bag of chippings inserted at the outlet end of the boiler while in operation would prove or disprove this, and if the latter, then he suggested that the structure be carefully examined. The leakage at the tube plate end was apparently caused through the formation of a hard scale, and it was necessary to remove this scale completely if the leakage was to be obviated. The tubes referred to by Mr. Greig were in his view amply long enough, and he suggested the use of the spring scraper from which some benefit would be derived. Replying to Mr. Sturrock, on the question of producer gas being supplied to the boiler from the setting, this was perfectly good practice when necessary. If the normal output of the boiler in summer months, working under waste heat conditions, was barely sufficient for the requirements and entailed putting on the works boiler, the admission of additional producer gas was advantageous rather than starting up another works boiler, which introduced losses in respect of fuel, wear and tear, and labour. The inlet temperature he had in mind when referring to the figure of 5·1 lb. steam/1 lb. fuel was the normal temperature of 650°-700° C. immediately prior to entering the boiler.

Mr. Poulson, in replying to Mr. Bateman, said that a boiler could be comfortably brought up to working pressure from cold in 4-5 hours, and he advised during this time the use of the blow off cock at regular intervals if a circulator was not fitted to the boiler. He also had no hesitation in saying that provided they had found a suitable feed water treatment the boiler could run 12 months at a time prior to shutting down. Replying to Mr. Milne, Mr. Poulson said that he agreed that circulators in some instances were advantageous although the water heater, providing the supply of hot water to the boiler, had gone a long way to obviate any temperature strains within the boiler itself. In this connection correct positioning of the boiler feed to the boiler and the correct tube spacing to give even heat transference to the water within the boiler had also had the careful attention of the boiler designers. Mr. Poulson said, in reply to Mr. Smith, that the choice of whether to use the exhaust steam from the fan turbine through a heater or admit it into retorts for steaming the charge lay in the fact as to whether the heated water from the condensers could be used, or, alternatively, if feed water heating could be done by any other of the works auxiliaries, then the turbine exhaust could be put into the reduced pressure side of the steam main feeding the retorts. As the volume of steam from this exhaust was constant, it provided a very satisfactory arrangement and one which was in operation in a number of works.

In reply to Mr. Kirk, the Author noted his remarks that they had had no trouble with the passage of the gas through the long flue from the Wilson house, the reason for this being the correct sizing or area of flues, which was so important if maximum boiler efficiency was to be obtained without impairing or altering the condition of the carbonizing unit. He thanked Mr. Kirk for the interesting information he had collected in regard to the additional evaporation obtained by the spring tube scraper over other types—the additional evaporation of 10% was a very useful amount of steam. Mr. Poulson was also glad that strict attention was being paid to guard against air infiltration and that the results were being well maintained. He agreed that the boiler could easily operate for 12 months prior to cleaning time, with suitable water treatment.

Gasholder Damage at Falkirk

In his monthly report to the Convener and Vice-Convener of the Falkirk Gas Committee, Mr. H. G. Ritchie, the Engineer and Manager, refers to damage caused by a gale on Oct. 26 to a spiral-guided holder of 1 million cu.ft. capacity. It is a two-lift holder in steel tank above ground, and was prepared for a third lift, and was erected 29 years ago. Ten of the guide carriages for the outer lift were broken off and the other two damaged. On the latter, the rollers were broken which would free the holder and allow it to blow about in the tank and smash the others. The fact that the holder was prepared for a third lift leaves more space between the holder and the tank. The gas in the inner (or top) lift had to be blown off as it could not be put on the town. The tank is now being emptied, and the water is down sufficiently far to show that the side sheets of the outer (or lower) lift are so badly buckled and holed as to require the lift to be renewed. On the inner lift two of the spiral guides were torn from the holder and had to be sawn off before the lift could be lowered into the tank, and all the guides are more or less damaged. Mr. Ritchie recommends the construction of a new two-lift holder in the existing tank, assuming that the tank is in good order. If the tank should be in such bad condition that it is decided not to reconstruct, he advises that a new holder of greater capacity be erected, say 1½ or 2 million cu.ft.

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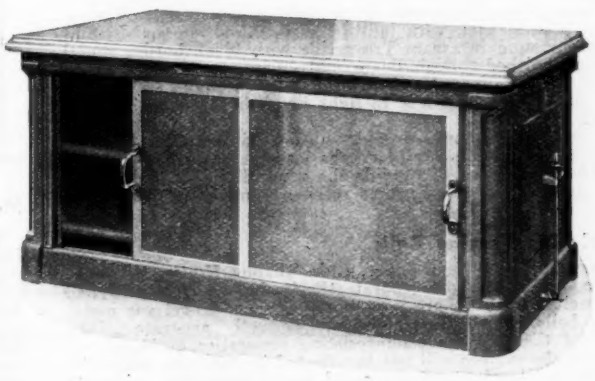

CARRON COMPANY
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Trade Notes

A New Design in Wash Boilers.

We have received particulars from Messrs. W. & H. Wilson, Ltd., of Leeds, of their "Elton" Wash Boiler, which is a distinct departure from the usual style. The name of Wilson has been connected with the manufacture of gas-consuming appliances for three generations, and is well-known in this sphere to our readers. In the "Elton" the makers have aimed at producing a wash boiler which is both modern and pleasing in appearance. To this end all projections have been eliminated, thus making the boiler very easy to keep clean; and the attractive synthetic paint finishes, in cream, blue or green, make it adaptable to interior colour schemes. Another new feature of the "Elton" is a special earthenware tray which completely protects the floor beneath the boiler from condensation and heat. The burner also has been designed to concentrate the intense heat of the flames towards the centre of the bottom of the tinned copper pan. A corrugated inner lining contacting with the sides of the pan harnesses the hot products of combustion from the flames and keeps them close to the sides of the pan, reducing their temperature by transference of heat to the water until they finally pass out of the flue. The boiler is mounted on a pressed steel stand, and is of 10 gallons capacity, which should fulfil practically every wash-day requirement.

Bending Machines for Copper Pipe.

The developing tendency to use light gauge copper tubing for gas services has often been checked by the difficulties encountered by the fitters in bending the copper tubes, especially as the eye is drawn towards them by a polished finish, and it is obviously essential that the bends should present a good appearance, free from kinks and marks of any kind. The use of springs and other methods of loading are slow, laborious, and expensive.

The use of a bending machine not only ensures that the bends are made in a fraction of the time taken by some methods but that they are free from all blemish.

The firm of bending machine specialists, Messrs. W. Kennedy, West Drayton, Middlesex, market a series of light gauge portable machines specially designed for this class of work. Not only can any bend up to 180° be made in about 10 seconds, unloaded, but the bends can be made in any position, equal measurement bending being simple and accurate. A feature of the No. 16 Kennedy Tube Bender is that the top arm can be instantaneously lifted off to facilitate entry or withdrawal of the tubes. The formers can be changed in six seconds and have only to be lifted on and off. Any reader of the "JOURNAL" may try this machine out for one week without any obligation.

The No. 12 machine will bend up to 1½ in. copper tubes, and as the bending arm operates from beneath the former the work can enter and be withdrawn without obstruction. A gauge is provided to set the machine to produce any set angle of bend; provision is also made for inserting a length gauge, so that uniformity is maintained for bending quantities of any set bend.

Established in 1904, Messrs. W. Kennedy also market bending machines for other classes of work such as gas pipes, steam tubing, conduit, solid bars, angles, tees, channels, and other sections.

Nautilus Settings for Gas Fires.

Some extremely attractive natural colour photographs of Davis gas fires in a series of marble surrounds specially designed for various settings are contained in a booklet recently published by the Nautilus Fire Company, Ltd., of Stratford Place, Oxford Street, W. 1.

Examples of both unit fires and built-in panel models show what beautiful settings can be provided, one, incorporating a painted pine mantel, with built-in shelves and cupboards, and marble surround in cream Travertine with black border round the green finished "High Beam" fire, being particularly noteworthy. A "Sunsquare" fire set in a surround of Belgian black marble with a frieze in light Swedish green also strikes a novel note.

This catalogue should provide much of interest to builders and architects, while it also emphasizes the fact that the Gas Industry is prepared to provide the whole fireplace and appropriate setting for the heating unit—not merely the gas fire alone.

Monel Gas Testing Bells.

Messrs. Henry Wiggin & Co., Ltd., Thames House, Millbank, London, S.W. 1, who incorporate the business formerly carried by Monel-Weir, Ltd., are now manufacturing Monel gas meter testing bells, which they claim are perfectly accurate. They point out that the corrosion-resisting properties of Monel ensure that the surface will not be affected in any way, while the strength and hardness of the metal are in every way adequate for the service.

"Gako" Gas Burners.

The use of gas as an industrial fuel is daily becoming more popular, and Liptak Furnace Arches, Ltd., 59, Palace Street, Victoria Street, S.W. 1, state that the key to the successful and economical use of gas is the burner, for all services requiring over 30 cu.ft. of gas per hour.

Low-pressure burners of the "Gako" type work with gas at, say, 2 in. to 4 in. w.g. and with cold or preheated air as may be desired, at similar pressure.

If the supply of gas available is at high pressure then a reducing valve is fitted to reduce the pressure to whatever is required. This enables extremely accurate control of the combustion at all rates of firing, as the air flow can be accurately adjusted to suit the gas flow and provide exactly what is required.

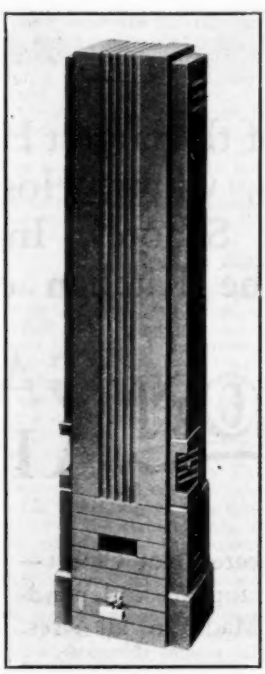
The flame given by low-pressure burners, it is stated, is relatively short, globular, and soft, and it is possible to provide for uniform diffusion without "stratification" in the combustion chamber, while any particular atmosphere, either neutral, reducing, or oxidizing, can easily be arranged for and maintained. "Gako" burners are at work burning half a million cu.ft. per hour in one burner, and at the other end of the scale only 300 cu.ft. per hour. From this it will be noted that the variations in size in which these burners are made is considerable.

The basic principle of the design is the passage of the air and the gas through the burner in alternate thin layers or streams, one or both of which is given a whirling motion by means of spiral guides and passages. These streams, on issuing from the nozzle of the burner, cross each other and form an intimate mixture, giving as nearly as possible complete combustion when fired.

It should be noted that by accurate regulation of the inlet valves just the right amount of air can be admitted to suit the gas flow and obtain the atmosphere required without any waste of gas, consequently the lowest possible consumption is obtained with "Gako" burners to suit any specified consumption conditions.

"Gako" burners are made in quite small sizes for use with hot water boilers, driers, stoves, processing plant of various kinds, furnaces, ovens, and for all purposes for which gas firing is suitable and desirable.

A New Gas Radiator.



The "St. Michael."

The "St. Michael," the new pillar-style gas radiator recently introduced by John Wright & Co., Ltd. (Radiation Ltd.), Essex Works, Birmingham, has already created a good deal of interest among users of gas radiators. A well-known firm has adopted the "St. Michael" for general use throughout its numerous branches and large orders, it is understood, are being received from many gas undertakings.

The "St. Michael" is a new radiator, designed on modern and compact lines. It occupies very little floor space, and its lines recommend it for shops, entrance halls, corridors, &c. Using very little gas, this appliance gives out a pleasant warmth, and is a most economical heating unit in every way. The gas rate is maintained constant by the use of a special burner.

The "St. Michael" radiator is available in a pleasing bronze finish, and the small window is of orange coloured glass. Two sizes are available, 34½ in. and 27½ in. in height respectively.

Metal Spun Pipes Up to 6 In. Diameter.

We are informed by the Staveley Coal and Iron Company, Ltd., nr. Chesterfield, that following the success which has resulted from the introduction of their 3 in. and 4 in. diameter metal spun pipes, they have decided to extend their plant to produce 6 in. diameter pipes of that type. Manufacture has now commenced, and the Company are in a position to give immediate deliveries from stock of the following metal spun pipes: 3 in. by 12 ft., 4 in. by 12 ft., and 6 in. by 12 ft. They will also be in a position to supply the 4 in. diameter in 18 ft. lengths by January, 1937.

A Fifty Years' Retrospect.

In commemoration of the fiftieth anniversary of the founding of the firm, J. & G. Weir, Ltd., of Cathcart, Glasgow, have published a most interesting booklet, which traces the growth and development of the concern from the days when, with 14 employees, they commenced the manufacture of feed pumps until the present time when some of their latest installations have included engines for autogiros and engine-room equipment for the *Queen Mary*.

This profusely illustrated account of the firm's fifty years' establishment is intended more as an intimate story than an exhaustive history, and much that would be of technical, scientific, and administrative interest has necessarily had to be omitted. The story is, nevertheless, one of absorbing interest and tells of the foundation of the firm by the two brothers, James and George Weir, whose first office was at 49, Jamaica Street, where the former carried out investigations into the causes of boiler corrosion and the heating of feed water. Cathcart, then a suburban village, was chosen as the site for their first machine shop, brass foundry, and smithy.

It is of interest to note that one of the first electric light installations in Scotland was set up in the firm's yard by Rankine Kennedy, pioneer in the early days of electrical development. The dynamo was driven by a gas engine and supplied current to light the yard and also the Cathcart Railway Station. Subsequent developments turned in the direction of water tube boilers, while the introduction of the steam turbine gave a considerable impetus to the firm's business, as this new prime mover necessitated independent air pumps.

It was in the year 1895 that the business was converted into a private limited liability company, and shortly after this Mr. George Weir retired and later went to Austrialia, where he died in 1910. During the whole development of the business, the leader and guiding spirit was Mr. James Weir—a man of outstanding ability and energy, whose practical genius produced the succession of brilliant patents on which the reputation of the firm was originally based.

The booklet goes on to refer to the development oil pumping units, centrifugal pumps, and compressors, while a section is devoted to the valuable work done during the war years in the production of munitions and other Navy, Army, and Air Force equipment. With the close of the war the the firm finished its extraneous work, rearranged its shops, and settled down once more to the needs of the mercantile marine, the Navy, and the power stations and industrial steam plants, in connection with which it is, perhaps, best known to the Gas Industry at the present time.

Cannon's New Season Gas Fire List

The term "list"—correct as it may be commercially—is really an injustice to the excellent publication, covering their new season's gas fires, recently issued by the Cannon Iron Foundries, Ltd., of Deepfields, nr. Bilston, Staffs. At the outset an original note is struck in the design of the front cover, which represents a portrait painting, complete with frame, of the founder of the firm, Edward Sheldon, who was born in 1795 and died in 1853.

The brochure goes on to deal with the Cannon inclined gas fires, whose extensive range of designs and choice of finishes facilitates selection of an appropriate model for any decorative scheme—and colour representations of several of the latest models in attractive settings prove the truth of this statement. The advantages claimed for the inclined arrangement of the radiants are clearly and concisely set out, while the further advance in the introduction of the V-inclined models, where the radiants are not only sloped but also stepped back from the centre, receives attention as well. The latest Cannon models are equipped with automatic flint ignition devices, operated merely by turning on the gas in the usual way.

A section is devoted to the new "Vitaglo" radiant, which is longer by nearly 2 in. than its predecessor, with an increased internal surface area and a close front structure of a similar hexagon pattern. An increase in the short-wave-length energy is claimed for this improved radiant.

The catalogue goes on to give illustrations and full specifications of the various Cannon fires, suitable for all applications, a special section showing examples in actual colours of the various pleasing finishes available. Finally, the firm's different types of gas radiator receive attention, while tables of gas consumptions, heating capacities, and other technical matters complete this very useful production—which, incidentally, introduces for the first time two of the firm's latest gas fires, the V-inclined "Verbena" and "Viola"—both very handsome appliances.

Gas Presents for Christmas.

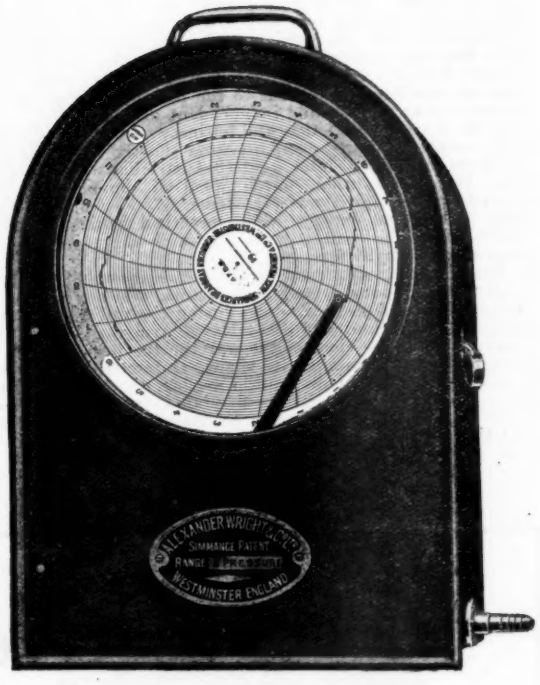
To help the consumer in his search for suitable gifts and to popularize "Gas" presents this year, the Horstmann Gear Company, of Bath, have instituted a scheme by which their Newbridge Gas Pistols may be offered as acceptable Christmas gifts for users of gas cookers. The pistol, which is simple and reliable in operation and gives instantaneous ignition, is being supplied to gas undertakings together with an attractive envelope printed with seasonable greetings, ready to be sent through the post.

Over 1,000 miles of
STANTON-WILSON
MAINS
The fact that in barely six years over 1,000 miles of Stanton-Wilson mains have been laid by about 700 public undertakings proves that the Stanton-Wilson Self-adjusting Pipe Joint has effectively solved the problems raised by ground subsidence and traffic vibration.
The most durable, trouble-free gas and water mains are those of Stanton "New" Spun Iron Pipes coupled with Stanton-Wilson Self-adjusting Joints.
The
STANTON-WILSON self-adjusting
PIPE JOINT
The Stanton Ironworks Company Limited, Near Nottingham

SIMMANCE
PATENT

DEAD-BEAT RECORDERS

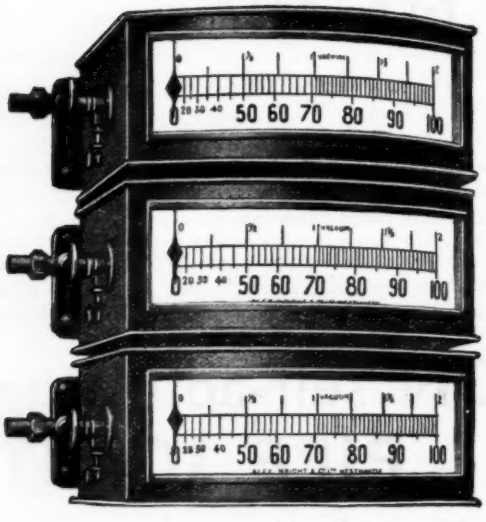
AND
INDICATORS



Here are two of the latest designs of DEAD-BEAT instruments.

The recorder is the new "SAXON" portable instrument—now a very popular model.

The lower illustration shews a 3-point Indicator, which embodies many novel and ingenious features, adapted to the horizontal form preferred by many Engineers.



These are but two examples of the application of the DEAD-BEAT system of diaphragms. There are many others, and there are many ways in which Dead-Beat instruments can be applied to meet individual requirements. For high pressures (exceeding 5 lbs.) a bourdon tube replaces diaphragms, and most forms can be supplied in ranges up to 1000 lbs./sq. inch.

WRITE FOR CATALOGUE DB.

ALEXANDER WRIGHT & Co. LTD. WESTMINSTER S.W. 1.

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

Active conditions again prevailed on the Stock Exchange last week, although prices in most sections were adversely affected by a large volume of profit-taking. Gilt-edged securities and home rails closed fractionally lower, an exception among the latter being L.M.S. ordinary, which continued in good demand. In the industrial section the heavy liquidation of speculative positions brought about a wholesome "shake out," but support was quickly forthcoming at the lower levels. Rubber and oil shares became somewhat irregular. In the mining market tin shares were again prominent and closed higher, but copper shares, though making some recovery late on Friday, did not entirely weather the large amount of profit-taking.

The volume of business in the Gas Market was heavier than the previous week, and prices on the whole remained steady with few changes either way. The feature was a sharp rise of 11 points to 185½ in Lea Bridge stock. This price is 5½ points higher than last year's best, and having regard to the Company's dividend record is amply justified. From 1923 to 1926 the distribution was 6½% per annum, in 1927, 7%, 1928, 7¾%, and from 1929 to 1935, 8½%, at which rate the yield on the current price works out at £4 11s. 7d%. The stock, however, is closely held and not as a rule readily obtainable. Several parcels of Swansea 5½% preference came into the market, and the quotation closed 3 points higher at 114½, while Montevideo stock hardened 2 points to 79½. Gas Light units reacted a further 6d. to 26s. 3d., though Sir David Milne-Watson's statement of the Company's progress, when addressing the Stockholders at an extraordinary general meeting on Friday last, should materially assist a recovery in the price. He mentioned, *inter alia*, that during the current year to date the Company had beaten its own record for the sale of gas. There were no price changes of importance in the Supplementary List or at any of the Provincial Exchanges.

The report and accounts of the Oriental Gas Company for the year ended June last show that the Company has had another successful year. The net profit is £38,758 (against £34,047), and £12,500 (against £10,000) has been transferred to reserve, which now stands at £52,500. The Directors are recommending a final dividend of 4½%, making 8% tax free for the year (unchanged), and the carry-forward is increased to £96,833. The stock is now quoted *ex* div. at 170½, which gives a return of £6 3s.% on the basis of the above dividend.

The recent issue by tender of £103,883 4% preference stock by the Croydon Gas Company at a minimum price of £106% has been subscribed for at an average price of £106 8s. 3d.%.

Current Sales of Gas Products

The London Market for Tar Products.

Nov. 16.

The current position in the London Tar Products market is as follows:

Pitch, nominal, at 34s. to 35s. per ton f.o.b.
Creosote, 5½d. to 5¾d.
Refined tar, 3¾d.
Pure toluole, 2s. 4d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, about 1s. 7d.; pyridine, firm, with 90/160 about 6s. 6d.—all prices per gallon naked at makers' works.

Tar Products in the Provinces.

Nov. 16.

The average prices of gas-works products during the week were: Gas-works tar, 18s. 9d. to 23s. 9d. Pitch—East Coast, 32s. to 34s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 32s. to 34s.* Toluole, naked, North, 1s. 11d. to 2s. Coal tar crude naphtha, in bulk, North, 8d. to 8¼d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 1½d. to 1s. 2½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¾d. to 5d.; low gravity, 4½d. to 4¾d. Heavy oils, in bulk, North, 5d. to 5¼d. Carbolic acid 60's, 2s. 7d. to 2s. 8d. Naphthalene, £18 to £20. Salts, 90s. to 95s., bags included. Anthracene "A" quality, 8d. to 3½d. per minimum 40% purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Nov.* 14.

No material alteration has taken place in market conditions during the week. The volume of new business is limited, but quotations are well maintained.

Crude gas-works tar.—The actual value is 34s. to 35s. per ton *ex* works in bulk.

Pitch remains rather uninteresting at 30s. to 32s. 6d. per ton f.o.b. Glasgow for export, and 30s. per ton *ex* works in bulk for home trade.

Refined tar is being held at 3d. per gallon f.o.r. for export, and 3¾d. per gallon (not 3¼d. as quoted last week) *ex* works in buyers' packages for home trade.

Creosote oil.—A small but regular trade is being conducted at or about the following figures: Specification oil, 4½d. to 4¾d. per gallon; low gravity, 4¾d. to 5d. per gallon; neutral oil, 4½d. to 4¾d. per gallon; all *ex* works in bulk.

Cresylic acid.—There is still a good demand for any supplies which are available and prices are steady as under: Pale, 97/99%, 2s. 4d. to 2s. 6d. per gallon; dark, 97/99%, 2s. 1d. to 2s. 3d. per gallon; pale, 99/100%, 2s. 9d. to 3s. per gallon; all *ex* works in buyers' packages.

Crude naphtha remains in good call at 5½d. to 6d. per gallon *ex* works in bulk, according to quality and district.

Solvent naphtha is 1s. 4½d. to 1s. 5d. per gallon for 90/160 grade, and 11d. to 1s. per gallon for 90/190 heavy naphtha.

Motor benzole is comparatively dull at 1s. 2½d. to 1s. 3d. per gallon.

Pyridines.—90/160 grade is now valued at 6s. to 6s. 6d. per gallon, and 90/140 grade at 7s. to 7s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	8½	to	0	9	per gallon at works
Motor "	1	2	"	1	2½	" " "
90% "	1	3	"	1	3½	" " "
Pure "	1	7	"	1	7½	" " "

Contracts Advertised To-Day

Benzole Plant.
Spenborough Gas Department. [p. 554.]

Carbonizing Plant.
Stretford and District Gas Board. [p. 554.]

Coke Grading Plant, &c.
Stretford and District Gas Board. [p. 554.]

Exhauster and Pump House.
Stretford and District Gas Board. [p. 554.]

Exhausters, Condensers, Washers, Tar Extractors, &c.
Spenborough Gas Department. [p. 554.]
Stretford and District Gas Board. [p. 554.]

Mechanics' Shop.
Spenborough Gas Department. [p. 554.]

Meter (Station).
Spenborough Gas Department. [p. 554.]

Pipes and Fittings.
Burton-upon-Trent Gas Department. [p. 554.]
Ripon Gas Department. [p. 554.]

Pumps (Tar and Liquor).
Stretford and District Gas Board. [p. 554.]

Tar.
Burton-upon-Trent Gas Department. [p. 554.]

Overseas Opportunities

India.

H.M. Trade Commissioner at Calcutta reports by air mail that the Indian Stores Department is calling for tenders (Order No. E.561) for the supply and delivery of suction gas plant, for the Imperial Institute of Veterinary Research, Muktesar, as follows: Two 25 K.W. gas engine driven D.C. generating sets to specification, and two suction gas plant units, each of suitable capacity for one 25 K.W. generating set, to specification. Tenders are also invited for spares for the above.

Tenders will be received in India up to Dec. 17, 1936. A copy of the specifications and general conditions of tender, together with drawing, may be inspected at the Department of Overseas Trade for three days subsequent to the date of this notification, after which the documents will become available for loan, in order of application. It is desirable for United Kingdom firms wishing to secure a fair share of orders from Government and other official departments in India to be represented locally. This Department will be pleased to assist United Kingdom firms who are unrepresented and have this question in mind by furnishing the names of suitable agents who may be willing to look after their interests.

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THE WEST SYSTEMS

OF MODERN GAS AND COKE PRODUCTION

The West organization has co-operated with progressive Gas Undertakings in 24 countries in their schemes of works modernization, plant renewal, and extension.

- **GLOVER-WEST VERTICAL RETORTS**
- **WESTVERTICAL CARBONIZING CHAMBERS**
- **BREEZE-FIRING PRODUCER EQUIPMENT**
- **WASTE-HEAT RECOVERY PLANTS**
- **THE WEST LIP-BUCKET CONVEYOR WITH AUTOMATIC LUBRICATION**
- **COKE GRADING AND PREPARATION UNITS**

Contracts placed with West's Gas Improvement Company, Ltd., during the present year have included carbonizing plant installations for the Gas Undertakings of *Altrincham, *Bilston, *Carlisle, *Dudley, *Worcester, and *Yeadon, in England ; *Dumbarton, *Grangemouth, and Kelso, in Scotland; *Ballymena, in Ireland, and *Johannesburg, in South Africa.

* Repeat orders

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: ALBION IRONWORKS, MILES PLATTING — 'Phone: COLLYHURST 2961 : 'Grams: "STOKER, MANCHESTER"

LONDON: COLUMBIA HOUSE, ALDWYCH, W.C.2 — 'Phone: HOLBORN 4108 : 'Grams: "WESGASCO, ESTRAND, LONDON"

MEMBERS OF THE SOCIETY OF BRITISH GAS INDUSTRIES

STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Nov. 13.	Rise or Fall on Week	Transactions, Lowest and Highest Prices During the Week.
1,767,439	Stk.	Sept. 7	7⅜	8	Alliance & Dublin Ord. ...	167—172	...	...
374,000	,,	June 22	4	4	Do. 4 p.c. Deb. ...	94—99	...	...
557,655	,,	Aug. 10	7	7	Barnet Ord. 7 p.c. ...	167—172	...	...
300,000	1	Oct. 5	1/9⅔	1/4⅔	Bombay, Ltd.	26/—28/-	...	27/6
179,305	Stk.	Aug. 10	9½	9½	Bournemouth sliding scale ...	220—230	...	225
590,407	,,	,,	7	7	Do. 7 p.c. max. ...	168—173	...	170—172
493,960	,,	,,	6	6	Do. 6 p.c. Pref. ...	148—153	...	150
50,000	,,	June 22	3	3	Do. 3 p.c. Deb. ...	85—90	+1	88—90
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	...	...
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	125—130	...	128½
357,900	,,	Aug. 10	7½	7½	Brighton, &c., 6 p.c. Con. ...	168—173	...	173
649,955	,,	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	153—158	...	156½
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	145—150	...	149
855,000	,,	Oct. 5	8	7	British Ord.	156—161	+1	158—161
100,000	,,	June 8	7	7	Do. 7 p.c. Pref.	151—156	...	...
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	108—113	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	110—115	...	...
200,000	,,	,,	3½	3½	Do. 3½ p.c. Red. Deb. ...	100—103	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	June 22	4½	4½	Do. 4½ p.c. Deb. ...	80—85	...	...
626,860	,,	July 20	6	6	Cardiff Con. Ord.	128—133	...	...
237,860	,,	June 8	5	5	Do. 5 p.c. Red. Deb.	108—113	...	...
609,204	1	Oct. 5	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	17/6—19/6	...	19/—19/3
296,053	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	21/—23/-	...	...
1,775,005	Stk.	Aug. 10	5	5	Commercial Ord.	93—98	...	93—94½
620,000	,,	June 8	3	3	Do. 3 p.c. Deb. ...	84—89	...	86
286,314	,,	Aug. 10	5	5	Do. 5 p.c. Deb. ...	122—127	...	...
807,560	,,	Aug. 10	7	7	Croydon sliding scale ...	158—163	...	160—163
644,590	,,	,,	5	5	Do. max. div.	115—120	...	119
620,385	,,	June 22	5	5	Do. 5 p.c. Deb.... ...	125—130	...	126½—128
239,000	,,	Aug. 10	5	5	East Hull Ord. 5 p.c.... ...	108—111	...	110½
184,555	,,	Aug. 10	6	6	East Surrey Ord. 5 p.c. ...	128—133	...	...
176,211	,,	June 8	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
250,000	1	June 22	4	4	Gas Consolidation Ord. ...	20/6—22/6	...	...
250,000	1	May 18	4	4	Do. 4 p.c. Red. Cum. Pref.	19/—21/-	...	...
19,284,128	Stk.	Aug. 10	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	25/9—26 9/a	—/6	25/10½—26/7½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.... ...	89—92	...	90½—91½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	105—109	...	107½—108
8,602,497	,,	May 18	3	3	Do. 3 p.c. Con. Deb. ...	87—90	...	87—88½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	117—120	...	119—120
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	115—118	...	116½—118
700,000	,,	Sept. 7	...	25/5§	Do. 3½ p.c. Red. Deb. ...	102—104	...	104
270,466	,,	Aug. 24	6	6	Harrogate New Cons. ...	128—133	...	...
213,200	,,	Aug. 10	6	6	Hornsey Con. 3½ p.c. ...	133—138	...	...
5,600,000	,,	Nov. †2	12	8	Imperial Continental Cap. ...	157—162*	—4	158—163½
223,130	,,	July 20	3½	3½	Do. 3½ p.c. Red. Debs.	92—97	...	...
285,242	,,	Aug. 24	8½	8½	Lea Bridge 5 p.c. Ord. ...	183—188	+11	...
11,731	,,	,,	10	8	Maidstone Gas 5 p.c. Cap. Stk.	190—200	...	...
63,480	,,	June 22	3	3	Do. 3p.c.Prp.Db.Sk.	80—85	...	85
75,000	,,	May 18	†10	†10	Malta & Mediterranean ...	190—200	...	...
392,000	—	Oct. 1	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	100—105	...	105
231,978	Stk.	Aug. 24	5	5	M.S. Utility 'C' Cons. ...	110—115	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	102—107	...	...
360,075	,,	June 22	4	4	Do. 4 p.c. Deb. ...	104—109	...	...
148,918	,,	,,	5	†5	Do. 5 p.c. Deb. ...	122—127	...	...
125,000	—	July 1	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	97—100	...	...
675,000	Stk.	June 22	†3	†6	Montevideo, Ltd.	77—82	+2	...
225,000	,,	Aug. 10	7½	7½	North Middlesex 6 p.c. Con.	170—175	...	172—173
396,160	,,	Aug. 10	5	5	Northampton 5 p.c. max. ...	110—115	...	...
300,000	,,	Nov. 2	†7	†9	Oriental, Ltd....	168—173*	...	169
416,617	,,	June 8	8	8	Plymouth & Stonehouse 5 p.c.	168—173	...	...
504,416	,,	Aug. 10	8½	8½	Portsmouth & Gosport Cons.	170—175	...	173
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	113—118	...	...
73,350	,,	,,	...	5	Do. 5 p.c. Pref. ...	118—123	...	119—120
363,470	1	Sept. 21	1/-	1/-	Severn Val. Gas Cor. Ld. Ord.	21/—23/-	...	...
454,510	1	,,	-/10½	-/10½	,, ,, 4½ p.c. Cum. Pref.	21/—23/-	...	...
133,201	Stk.	Aug. 24	5	8½	Shrewsbury 5 p.c. Ord. ...	145—150	...	...
90,000	10	June 8	†3½	†4	South African...	4—5	...	...
1,152,635	1	Sept. 7	1/2½	1/2½	South East'n Gas Cn. Ld. Ord.	26/—29 -	...	28/—28/6
845,511	1	,,	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pref.	21/—23 -	...	22/3
200,000	1	,,	4	4	Do. 4 p.c. Cum. Pref. ...	20/6—21/6	...	21/6
150,000	Stk.	Aug. 10	...	3½	Do. 3½ p.c. Red. Deb. ...	100—102	...	...
6,709,895	,,	Aug. 10	6½	5	South Met. Ord.	116—119	...	116½—119
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf....	145—150	...	147½—148½
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf....	104—107	...	105½—1 '6½
1,895,445	,,	June 22	3	3	Do. 3 p.c. Deb. ...	87—90	...	87½—88½
1,000,000	,,	July 6	5	5	Do. 5 p.c. Red. Deb.	114—117	...	...
1,543,795	,,	Aug. 10	6	6	South Suburban Ord. 5 p.c....	130—135	...	132½—134½
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	122—127	...	126½
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	102—107	...	104½
888,587	,,	June 8	5	5	Do. 5 p.c. Deb....	123—128	...	124½
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	102—107	...	...
427,859	1	May 4	9⅜	1/2⅜	S. Western Gas & Water Ord.	21/6—23/6	...	22/-
160,523	1	Oct. 19	-/10½	-/10½	Do. 4½% Red. Cum. Pref.	20/6—22/6*	...	...
110,000	Stk.	June 22	4	4	Do. 4% Red. Deb. ...	100—105	...	...
647,740	,,	Aug. 10	5½	5	Southampton Ord. 5 p.c. ...	112—117	...	115½—117
121,275	,,	June 8	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
350,000	,,	Aug. 10	5½	5½	Swansea 5½ p.c. Red. Pref. ...	112—117	+3	115½—117
106,000	,,	June 8	6½	6½	Do. 6½ p.c. Red. Deb. ...	98—101	...	...
94,000	,,	,,	§35/-	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...	...
1,076,490	,,	Aug. 10	6⅔	6⅔	Tottenham and District Ord.	152—157	...	153½—156
409,835	,,	,,	5⅓	5⅓	Do. 5⅓ p.c. Pref....	130—135	...	131—133
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	...
371,850	,,	June 8	4	4	Do. 4 p.c. Deb. ...	103—108	...	107
369,774	,,	Aug. 10	7	7	Uxbridge, &c., 5 p.c. ...	165—175	...	...
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	...
1,340,521	,,	Aug. 10	7	7	Wandsworth Consolidated ...	159—164	...	161
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	122—127	...	124½—125
500,000	,,	,,	...	...	Do. 4 p.c. Pref. ...	104½—107½	...	...
1,317,964	,,	June 8	5	5	Do. 5 p.c. Deb. ...	127—132	...	130½
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
499,735	,,	Aug. 10	7½	7	Watford and St. Albans Ord.	157—162	...	...
200,000	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	125
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	131—136	...	...
200,000	,,	June 22	4	4	Do. 4 p.c. Red. Deb.	100—105	...	...
100,000	,,	,,	...	3½	Do. 3½ p.c. Red. Deb.	99—102	...	...
158,400	,,	Aug. 24	6b	5½	Winchester W. & G. 5 p.c. Con.	120—125	...	...

a.—The quotation is per £1 of Stock. b.—Paid £3, including 10s. on account of back dividends. * Ex div. † Paid free of income-tax. ‡ For year. § Actual.

Stock and Share List continued overleaf.

A Manual of

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in

Horizontal Retorts

by G. M. GILL, M.I.Mech.E., M.Inst.Gas E.

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Bad Gas : its Cause and Prevention.

Direct Fired Furnaces.

The Producer Type of Furnace.

Ascension, Bridge and Dip Pipes.

The Hydraulic Main.

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STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Nov. 13.	Rise or Fall on Week.	Transactions, Lowest and Highest During the Week.
BRISTOL EXCHANGE.								
347,756	Stk.	July 20	6	5	Bath Cons.	122½—124½	...	...
1,667,250	,,	July 6	5	5	Bristol, 5 p.c. max. ...	120—122	...	...
120,420	,,	June 8	4	4	Do. 1st 4 p.c. Deb. ...	103—105	+ 1½	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	103—105	+ 1½	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	124—127	...	...
274,000	,,	Aug. 10	5	5	Newport (Mon.) 5 p.c. max. ...	110—114	...	...
13,200	12	Sept. 7	8½	7	Pontyp'l Gas & W. 10 p.c. 'A.'	13½—14½	...	...
13,600	10	,,	6	5	Do. 7 p.c. B.'	12—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C.'	12—12½	...	...
140,778	Stk.	Aug. 10	5	5	Weston-super-Mare Cons. ...	112—114	...	...
64,338	,,	June 22	4	4	Do. 4 p.c. Deb.	100—102	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	163—166	...	...
LIVERPOOL EXCHANGE.								
137,150	Stk.	Aug 10	6½	5	Chester 5 p.c. Ord.	107—112	...	...
92,500	,,	June 8	4	4	Do. 4 p.c. Pref.	98—102	...	...
32,540	,,	,,	3	3½	Do. 3½ p.c. Deb ...	90—95	...	...
41,090	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	99—103	...	...
2,167,418	,,	Aug. 24	6	6	Liverpool 5 p.c. Ord. ...	135—137	...	...
245,500	,,	June 22	5	5	Do. 5 p.c. Red. Pref ...	103—108	...	...
306,083	,,	July 6	4	4	Do. 4 p.c. Deb. ...	104—106	...	...
106,280	,,	July 20	10	10	Preston 'A' 10 p.c. ...	198—208	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	137—147	...	...
NEWCASTLE EXCHANGE.								
122,877	Stk.	Aug. 10	8	8	Blyth 5 p.c. Ord.	153—155	...	...
782,000	,,	Aug. 10	5	5	Hartlepool G. & W. Co. & New	124—126	...	...
2,061,313	,,	Aug. 10	5½	5	Newcastle & Gateshead Con.	28 —28 6*a*	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	103—105	...	...
776,706	,,	June 22	3½	3½	Do. 3½ p.c. Deb. ...	99—101	...	...
277,285	,,	May 4	5	5	Do. 5 p.c. Deb. '43...	108—109	...	...
209,820	,,	Aug. 10	8½	8½	South Shields Con.	172—174	...	...
299,542	,,	Aug. 10	6	6	Sunderland 6 p.c. max. ...	132—134	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Aug. 10	10	7	Derby Con.	185—190	...	...
55,000	,,	June 22	4	4	Do. 4 p.c. Deb.	100—105	...	...
64,750	,,	Feb. 17	5	12	Long Eaton 'A' Ord. ...	...	...	...
50,000	,,	,,	4	10	Do. 'B' Ord. ...	...	...	...
20,000	10	June 8	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 10	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,606,339	,,	Aug. 24	6	6	Sheffield Cons.	146—148	...	...
95,000	,,	July 6	4	4	Do. 4 p.c. Deb.	102—105	...	...

a The quotation is per £1 of Stock.

Supplementary List of Stocks and Shares not Officially Quoted

202,152	Stk.	Nov. 2	5	25/-*a*	Ascot Ord.	118—123*	...	...
128,182	,,	July 6	...	5	Do. 5 p.c. Pref.	115—120	...	...
238,631	1	June 8	5	5	Assd. Gas and Water Ord. ...	21/—23/-	...	...
323,681	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	21/6—23/6	...	...
150,000	Stk.	Sept. 21	...	3½	Do. 3½ p.c. Red. Deb. ...	98—101	...	...
17,000	,,	Aug. 24	8	8	Bognor Orig. Ord. 'A' ...	175—185	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	175—185	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	145—150	...	...
37,440	,,	Aug. 10	10	10	Cam.Univ. & Town 10 p.c.max.	205—215	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	155—160	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	108—113	...	...
65,000	,,	Aug. 10	8½	7½	Eastbourne 'A' 5 p.c. ...	175—180	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	142—147	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	...
130,000	,,	June 22	5	5	Do. 5 p.c. Deb.	124—129	...	...
24,000	30	Aug. 10	8½	8½	Great Yarmouth 8½ p.c. max.	51—56	...	...
59,400	30	,,	7½	7½	Do. 7½ p.c. max.... ...	42—45	...	...
51,160	Stk.	June 8	5½	5½	Do. 5½ p.c. Deb.... ...	123—128	...	...
152,600	,,	Sept. 7	8	8	Guildford Cons.	182—192	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	114—119	...	...
68,250	,,	June 8	5	5	Do. 5 p.c. Deb.	120—125	...	...
156,600	,,	Aug. 24	7½	7½	Hampton Court Cons. ...	173—178	...	...
107,960	10	Oct. 5	5½	4	Mid Kent Ord.	10—11	...	...
230,940	Stk.	Aug. 10	10	10	Oxford & District Ord. ...	210—220	...	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pre ...	113—118	...	...
126,193	,,	May 18	7½	7½	Peterborough Ord.	160—170	...	174
64,990	,,	Sept. 7	6½	7½	Redditch Ord.	133—143	...	...
166,850	,,	Aug. 10	9	8	Romford Ord.	168—178	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Sept. 21	5	5	Do. 5 p.c. Deb.	120—125	...	...
10,950	,,	Aug. 24	8	8	Ryde Ord.	165—170	...	...
136,191	,,	Aug. 10	7	5	Scarborough Ord.	126—136	...	...
27,825	,,	Aug. 24	8	8	Shanklin & Ventnor Cons. ...	180—190	...	...
40,643	,,	Sept. 21	7	7	Slough Ord.	156—161	...	...
221,000	,,	June 22	5	5	Do. 5 p.c. Deb.	116—121	...	...
28,872	1	Nov. 2	5½	5½	S. Midland Gas Cpn.Ltd. Ord.	22/—24/-*	...	...
28,866	1	Sept. 7	4½	4½	Do. 4½ p.c. Red. Cum Pref.	22/—24/-	...	...
137,730	Stk.	Aug. 10	7	7	Southgate & Dist. 7 p.c. max.	151—156	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	...
117,228	,,	Aug. 10	6	5	Swindon Cons.	110—115	...	...
60,425	,,	June 22	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
64,380	,,	June 8	5	5	Torquay and Paignton 5 p.c. Pf.	117—122	...	...
750,000	1	Oct. 5	5·52d.*a*	4	Utd. Kingdom Gas Cpn. Ord.	21/6—22/6	...	21/10½—22/4½
468,574	1	,,	2½	2½	Do. 4½ p.c. Prefd. Ord....	20/—22/-*	...	...
935,902	1	May 18	2½	4½	Do. 4½ p.c. Cum. Pref. ...	22/6—23/6	...	...
600,000	Stk.	Sept. 21	3½	3½	Do. 3½ p.c. Red. Deb. ...	99—102	...	101—101¾
130,000	,,	Aug. 10	8	5	Wakefield Ord.	140—145	...	...
81,650	,,	,,	5	5	Do. 5 p.c. max.	105—110	...	...
82,000	,,	July 20	6	6	Weymouth Ord.	105—110	...	...
98,384	,,	Aug. 10	6	6	Wolverhampton 6 p.c. Pref.	127—132	...	...
160,000	,,	June 8	5½	5½	Do. 5½ p.c. Rd. Db	107—112	...	...
370,000	,,	July 20	6	4	York Cons.	111—116	...	112
90,000	,,	June 22	5	5	Do. 5 p.c. Red. Deb. ...	107—112	...	...
133,640	,,	July 20	6½	6½	Yorkstown (Cam.) 5 p.c. Cons.	130—135	...	...
120,000	,,	,,	5	5	Do. 5 p.c. Pref.	118—123	...	...
35,000	,,	June 22	5½	5½	Do. 5½ p.c. Deb.... ...	130—135	...	...

a Actual.

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